Soil Survey

Series 1934, No. 14. Issued February, 1939

Hunt County
Texas

By
E. H. TEMPLIN, in Charge, and R. M. MARSHALL
Texas Agricultural Experiment Station

UNITED STATES DEPARTMENT OF AGRICULTURE
BUREAU OF CHEMISTRY AND SOILS
In cooperation with the
Texas Agricultural Experiment Station

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COUNTY SURVEYED

Hunt County is in the northeastern part of Texas (fig. 1). Greenville, the county seat, is about 50 miles northeast of Dallas, 40 miles south of the Oklahoma State line, 120 miles west of the Louisiana State line, and 265 miles from the Gulf of Mexico. The shape of the county is roughly rectangular; its distance from north to south is approximately 35 miles, and from east to west, 25 miles. It has an area of 893 square miles, or 571,520 acres.

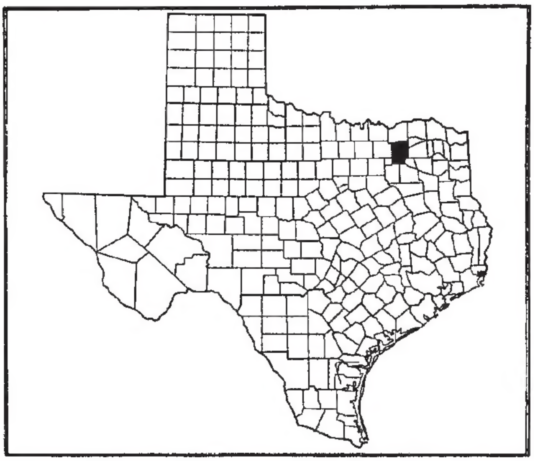

FIGURE 1.—Sketch map showing location of Hunt County, Tex.

Hunt County lies within the eastern part of the blackland prairie of Texas. Large areas in the eastern and southwestern parts of the county, however, are isolated sandy timbered sections similar to the main body of the Gulf Coastal Plain. The blackland prairie is a natural province of dark-colored soils developed from unconsolidated highly calcareous marine sediments. Originally, a dense vegetation of tall prairie grasses covered the area, but practically all native growth has been plowed up. The province is a smooth undulating erosional plain sloping gently toward the Gulf of Mexico and is a part of the interior margin of the Gulf Coastal Plain. Agriculturally, it is the most intensively cultivated natural province of Texas. Physiographically, the county is part of a smooth vast plain produced by long-continued erosion of nearly level unconsolidated rock sheets. Dissection is complete, or nearly so. Long narrow parallel drainageways characterize the major drainage pattern, a good example of which is Caddo Creek with its tributaries in the west-central part of the county. The streams are intermittent, but have broad flood plains; the stream valleys are shallow; and the drainage divides are well rounded. The extreme northwestern and most rolling part

of the county, an area of about 30 square miles, lies within the drainage basin of Trinity River; the northeastern quarter, an area of about 230 square miles, lies within the drainage basin of Sulphur River; and the rest is drained by Sabine River. Trinity and Sabine Rivers empty into the Gulf of Mexico, and Sulphur River flows into Red River in Louisiana.

The relief is very smooth, somewhat smoother than the average of the Texas blackland prairie as a whole. About one-third of the county has a slope of less than 1 percent, about four-fifths a slope of less than 3 percent, and less than one one-hundredth a slope greater than 10 percent. The more strongly rolling areas occur chiefly in the headwater drainage areas of Trinity River in the vicinities of Indian Creek School and Lane west of Celeste, in a small but conspicuous escarpment just west of Lone Oak, and in a gentle escarpment extending from near Merit to Wolfe City. The most extensive nearly level upland areas are on the north side of Middle Sulphur River between Commerce and Fairlie, on the divide between Caddo Creek and South Fork Sabine River east of Quinlan, in Kuykendoll Prairie northeast of Quinlan, and in the vicinities of Dixon, Cash, Hickory Creek, and South Sulphur. These areas are not underlain by a shallow permanent ground-water table, but they are so nearly level that, prior to the construction of graded roads and a few open drainage ditches, thin sheets or pools of water remained on the surface for considerable periods following heavy rains. The general types of relief are indicated approximately on the detailed soil map accompanying this report, by the drainage pattern and by the distribution of soils, each of which has characteristic topographic features.

The general regional slope is to the southeast and is approximately 5 feet to the mile. The elevations above sea level range from about 450 feet at the point where Sabine River leaves the county in the southeastern corner to 700 feet on the divides between the headwaters of Trinity, Sabine, and Sulphur Rivers 3 miles northwest of Celeste. According to railway station elevations, the elevation above sea level at Celeste is 660 feet, at Kellogg 580 feet, at Greenville 550 feet, at Lone Oak 562 feet, at Campbell 585 feet, and at Commerce 548 feet. The average fall from Greenville to the Gulf of Mexico is 2 feet to the mile. Cow Leech Fork Sabine River south of Greenville has a fall of about 4½ feet to the mile,[1] and near Commerce South Sulphur River has a fall of 5 feet to the mile.[2]

Good well water is not obtainable in many areas. It is generally available in areas occupied by sandy soils or underlain at slight depths by chalk. It is scarce, as a rule, below areas of prairie soils where only moderate quantities can be obtained from wet-weather wells in slight depressions or adjacent to streams. Most of the farm homes depend on rain water, which is collected in cisterns, for drinking purposes. Water for livestock commonly is supplied by small surface reservoirs constructed by building earthen dams across small drainageways. All the streams cease to flow during extremely dry periods, but even in such periods, there are a few stagnant pools in the beds of the larger streams.

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[1] Data supplied by a private engineer from a preliminary survey of the river made in connection with a proposed drainage district.

[2] Computed from topographic sheets of the Texas Reclamation Department.

Originally the county was a grassy prairie interrupted by strips of timber growing along the watercourses and on the light-colored sandy soils. On the heavy soils of the prairies, judging from the present growth on the remaining remnants of virgin prairie, the native vegetation consisted largely of tall prairie grasses. Chief of these, on the calcareous soils, are bluejoint turkeyfoot, locally called big bluestem (*Andropogon furcatus*), prairie beardgrass, locally called little bluestem (*A. scoparius*), and Indian grass (*Sorghastrum nutans*), intermixed with less amounts of longleaf dropseed (*Sporobolus asper*), silver beardgrass (*A. saccharoides*), side-oats grama (*Bouteloua curtipendula*), and buffalo grass, locally called mesquite grass (*Buchloë dactyloides*). The medium-textured soils of the prairies support a somewhat different grassy vegetation of different species and genera, including considerable amounts of the three-awn grasses, locally called needlegrass (*Aristida* sp.), and species of *Bouteloua*, *Panicum*, *Paspalum*, *Sporobolus*, and other genera, with some buffalo grass in places. The light-colored sandy soils support a growth of small post oak and blackjack oak trees, with very little underbrush. The flood plains along the various streams have a denser forest growth of hardwood trees, chiefly bois d'arc, water oak, willow oak, bur oak, overcup oak, southern red oak, elm, hackberry, hickory, pecan, black willow, and cottonwood.[3] Very little native vegetation remains on the prairie, as most of the land is in cultivation; but large areas of the timbered soils have never been cleared.

The two most common noxious weeds in cultivated fields are Johnson grass and Bermuda grass. Both are introduced plants which have become widespread and have considerable value as pasture and hay crops. Although difficult to eradicate, they can be controlled and are not long present in well-tilled fields. Johnson grass is most troublesome on the bottom lands and to less extent on the heavy prairie soils. It can be eradicated by close pasturing for several years, by clean cultivation, or by treatment with chemicals. Bermuda grass, which can be destroyed by intensive cultivation, is most widespread on the medium-textured prairie soils and light-colored sandy soils. Two other noxious weeds of minor distribution are nutgrass and field bindweed, locally called possession vine (*Convolvulus arvensis*). The most common weed in cultivated fields on blackland soils is Texas millet, locally called hurrah grass, and on the medium-textured prairie soils and light-colored sandy soils crabgrass is a prevalent pest. Abandoned fields allowed to revert to pasture or meadow do not produce a good stand of desirable vegetation without sodding or seeding. The abandoned-field pastures are occupied largely by an undesirable weedy growth, with scattered patches of three-awn and Bermuda grass. Unless artificially seeded, the original prairie grasses do not reestablish themselves for an extremely long time. Bermuda and Johnson grasses are practically the only desirable meadow and pasture plants which reestablish themselves naturally, and excellent stands, even of these, are not obtained, as a rule, without some cultural treatment.

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[3] The discussion of native vegetation and the identification of plants are based largely on an unpublished manuscript entitled "A Short Survey of the Vegetation of Rockwall County, Texas," by H. Ness, botanist, Texas Agricultural Experiment Station. October 15, 1923.

Settlement of the area that is now Hunt County commenced about 1830, proceeded gradually until about 1870 when it was accelerated by the construction of railroads into the surrounding areas, and was practically completed by 1910, by which time most of the good land was in cultivation. Most of the early settlers were native whites from the older Southern States, and some of them brought in Negro slaves. The county was organized in 1846. It was formed from parts of Fannin and Nacogdoches Counties. It was reduced to its present size in 1870, when a part was taken into Rains County.

The total population of Hunt County, according to the census of 1930, is 49,016, of whom 42,016 are native whites, 5,653 Negroes, 279 Mexicans, 2 Chinese, and 91 foreign-born whites. The classification as to residence is as follows: 26,274, rural farm; 16,674, urban; and 6,068, rural nonfarm. The same census gives the population of Greenville as 12,407, Commerce 4,267, Wolfe City 1,405, Celeste 803, Lone Oak 720, Quinlan 512, and Campbell 416.

The county is well supplied with transportation facilities to outside markets by lines of five railroad systems, two Federal highways (United States Highways Nos. 67 and 69), and two State highways. These main highways are passable throughout the year. No part of the county is more than 10 miles distant from a railroad shipping point. The nearest steamship port is Houston, which is 310 miles by rail from Greenville. Most of the county roads are graded dirt roads which are maintained in fairly good condition, but those within the blackland areas are sometimes impassable for automobiles as long as a month at a time during rainy winters.

Cotton gins and local cotton buyers are in all the larger towns and most of the smaller villages. Most of the cotton produced is shipped to Houston or Galveston for export. Sour cream is marketed by shipment to dairy plants located from 20 to 50 miles outside the county. Most of the livestock and grain shipped out is marketed in Fort Worth, 84 miles by highway from Greenville, where a livestock exchange, central grain market, and large meat-packing houses are located. Dallas, a metropolis of about 300,000 population, is 51 miles from Greenville.

The rural schools of standard scholastic rating are distributed at convenient intervals. The East Texas State Teachers College is in Commerce, and Wesley College, a Methodist school of higher education, is in Greenville. Rural telephone service is available in most communities, and rural electric-power lines serve a few communities.

There are no manufacturing industries of importance, other than cottonseed-oil mills at Greenville, Commerce, Wolfe City, and Lone Oak, and flour mills at Greenville and Wolfe City. The county has been the scene of extensive exploration for petroleum, and many landowners have received considerable income from the sale of oil leases. As yet, however, oil has not been discovered in commercial quantities.

A cotton-breeding field station of the Bureau of Plant Industry, United States Department of Agriculture, is located just outside the southwestern city limits of Greenville.

CLIMATE

The climate of Hunt County is humid and temperate. Although not extreme, the climate is continental and is characterized by irregu-

larity of rainfall, sudden changes of temperature, and relatively low humidity. The amount and distribution of the summer rainfall is approximately the same as in the subhumid region, and it might be said that the winters are humid and the summers subhumid. There are no long periods of pronounced wet and dry seasons. As a rule, the period of greatest rainfall is in April and May. This is followed by a fairly dry period in late summer and another period of higher rainfall in October. The actual distribution of the precipitation is variable, and crops suffer occasionally from lack of moisture.

The difference of 37.5° F. between the average summer and winter temperatures is moderate. The summers are long with hot days and warm nights. The daily mean maximum temperature is 97° during July and above 90° in June, August, and September. The absolute maximum and minimum temperatures, as recorded at Greenville, are 115° and 1°, respectively. The winters are short and mild, but temperatures as low as 10° below freezing occur during most winters. The winters are characterized by periods of warm balmy days suddenly followed by cold waves accompanied by north winds. These cold spells, or northers, last only a few days.

The average frost-free season is 236 days, from March 22 to November 13. Frost has occurred, however, as late as April 30 and as early as October 19. Hardy vegetables, winter cereals, and hardy legumes make some growth throughout the winter. The average annual snowfall is only 2.2 inches. Local hailstorms occasionally occur with consequent damage to crops in small areas. The rate of evaporation is rather high. The prevailing wind direction is from the north during the winter and from the south during other seasons.

The character of the climate is such that, in order to be excellently adapted, crops must possess the ability to become practically dormant during dry spells and to recuperate quickly whenever rains occur. The climate is very favorable for cotton which requires considerable periods of dry hot weather to grow best and which is also fairly drought-resistant. The growing season is more than long enough, and the summer temperatures are favorable. Although cotton yields are sometimes limited by lack of moisture, the rainfall nearly always is ample for the production of a good crop. During very wet seasons, yields more generally are reduced, because of injury from cotton root rot and insect pests.

The climate generally is too hot and dry and the precipitation too variable for excellent yields of corn. As a rule, in this section, corn suffers from lack of moisture during the critical tasseling stage, but it produces fairly well on the flood-plain soils and on those upland soils having the most favorable moisture conditions. Owing primarily to unfavorable moisture conditions, the average yield of corn is approximately only one-half as great as that in the Corn Belt of central United States. Although corn is the dominant and one of the most productive feed crops of this section, there is need for the development of feed crops better adapted to the climate.

Grain sorghums are well adapted to the climate, but they suffer from various diseases and insect pests. The best varieties yield approximately the same or slightly greater quantities of grain than does corn. Native prairie grasses, sorgo, Sudan grass, and Johnson grass are the grasses best adapted to the climate. Many of the soils are

suited to alfalfa, sweetclover, cowpeas, and peanuts, and these legumes are well adapted to local climatic conditions. Clover, alsike clover, timothy, and similar crops do not succeed so well here as in more northern latitudes.

Table 1, compiled from the records of the United States Weather Bureau station at Greenville, presents climatic data which are fairly representative for the county as a whole.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Greenville, Hunt County, Tex.*

[Elevation, 550 feet]

Month	Temperature			Precipitation		
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1910)	Total amount for the wettest year (1902)
	°F.	°F.	°F.	Inches	Inches	Inches
December	45.4	80	10	3.03	1.85	2.90
January	44.8	90	1	2.49	1.00	1.44
February	47.6	95	1	2.26	1.45	2.88
Winter	45.9	95	1	7.78	4.30	7.22
March	56.6	95	18	2.77	1.90	3.23
April	64.4	93	28	4.42	3.10	2.14
May	71.8	103	34	4.58	2.40	4.33
Spring	64.3	103	18	11.77	7.40	9.70
June	81.0	107	49	3.13	3.25	1.84
July	84.5	111	56	3.31	.50	11.96
August	84.7	115	56	2.68	.00	.41
Summer	83.4	115	49	9.12	3.75	14.21
September	78.5	106	41	2.72	.80	8.32
October	66.7	100	21	3.28	1.38	7.91
November	55.4	90	19	2.60	.00	13.21
Fall	66.9	106	19	8.60	2.18	29.44
Year	65.1	115	1	37.27	17.63	60.57

AGRICULTURAL HISTORY AND STATISTICS

Agriculture began in Hunt County between 1830 and 1840. At first it consisted largely of cattle raising, with the incidental production of some foodstuffs for home use. Livestock grazing continued to be the major agricultural enterprise, especially in sections of heavy prairie soils, until about 1880. Following the construction of railroads into the section about 1870, the amount of cultivated land increased rapidly until about 1900. Most of the cultivated land was first broken during that period. Since 1900 the increase in the total acreage of crops has been gradual.

At first corn and, to less extent, wheat were the major crops, but cotton early assumed major importance. The proportion of the total cultivated land devoted to cotton in recent years was, prior to 1933, more than 70 percent. In that year the acreage in cotton was reduced, and, in 1934, it represented 49 percent of the cropland. The dominance of cotton varies to some extent with the soil and the farmer, but it prevails throughout the county. On most farms no other major crop and only very small numbers of livestock and small

amounts of livestock products are produced for sale. The most widely grown feed crops are corn, oats, sorgo, and grain sorghums, but, for the most part, these are produced only to feed the few farm livestock. On some farms, the income is derived from the sale of quantities of special crops and products, of which the most important are onions, sweetpotatoes, peanuts, cowpeas, peaches, berries, cucumbers, potatoes, and sorgo sirup.

Table 2, giving the acreages of the principal crops grown in this county, was compiled from the United States census reports.

TABLE 2.—*Acreages of principal crops in Hunt County, Tex., in stated years*

Crop	1879	1889	1899	1909	1919	1929	1934
	Acres	*Acres*	*Acres*	*Acres*	*Acres*	*Acres*	*Acres.*
Cotton	25,906	78,245	132,364	190,667	187,881	232,880	148,227
Corn	29,157	46,599	89,060	94,442	50,310	51,837	62,296
Oats, threshed	6,314	11,315	32,686	12,442	48,904	16,689	31,349
Oats, cut and fed unthreshed	----	----	----	----	----	6,327	11,661
Wheat	7,385	2,583	19,916	698	17,525	533	3,526
Sorghums for grain	----	----	----	11	599	2,711	4,487
All hay	2,093	13,707	8,017	5,415	5,036	4,999	[1] 10,705
Tame hay	----	----	2,397	1,641	2,273	1,972	----
Wild hay	----	----	5,620	3,774	2,763	3,027	----
Sorghums for silage, hay, or fodder	----	----	----	----	[2] 6,848	7,571	22,508
	Trees	*Trees*	*Trees*	*Trees*	*Trees*	*Trees*	*Trees*
Peaches	----	101,281	103,394	48,860	40,559	29,095	25,444
Pecans	----	----	----	2,047	2,526	4,367	([3])

[1] Does not include sorghums for hay.
[2] For forage only.
[3] Not reported.

The number and value of livestock on farms are given in table 3.

TABLE 3.—*Number and value of livestock on farms in Hunt County, Tex., in stated years*

Livestock	1880 [1]	1890 [1]	1900 [1]	1910		1920		1930		1935 [1]
	Number	*Number*	*Number*	*Number*	*Value*	*Number*	*Value*	*Number*	*Value*	*Number*
Cattle	33,212	36,269	34,126	19,297	$497,836	17,160	$765,978	19,769	$713,149	26,848
Horses	10,760	13,361	13,252	10,743	1,042,275	7,653	738,874	5,137	207,304	4,117
Mules	1,863	4,301	8,551	9,392	1,155,350	9,809	1,517,608	13,062	842,717	11,141
Sheep	6,812	1,117	1,963	2,515	8,957	2,043	24,957	1,637	9,940	2,996
Swine	20,712	26,370	39,770	19,804	165,313	17,298	233,670	9,726	88,258	9,974
Chickens	[2] 44,337	260,344	242,206	[2] 215,121	[2] 71,836	[2] 244,577	[2] 205,482	215,460	148,667	194,307

[1] Value not reported.
[2] All poultry.

The 1935 census reports 5,891 farms in the county, occupying 487,011 acres, or 85.2 percent of the total land area. The average value of land and buildings is given as $3,407 per farm, and the average size of farms as 82.7 acres. In 1934, 309,449 acres were devoted to crops.

Very little commercial fertilizer is used. According to the census report for the year 1929, 113 farms reported expenditures for fertilizer amounting to a total of $8,399. Some of this consisted of cottonseed meal, and the rest was ready-mixed fertilizer. Barnyard manure is not conserved carefully, and, owing to its rapid decomposition in this warm climate, very little is available. Most of the available supply is used on the gardens.

Farm labor generally is plentiful and comparatively cheap. Most of the labor is performed by the farmer and his family, but usually some extra help is hired for the picking of cotton and, to less extent, for the chopping of this crop. In 1929, wages amounting to $723,862 were paid on 3,140 farms, or 53 percent of the total, and the average expenditure per farm hiring labor was $230 for 121 workdays. The hired laborers are mainly Negroes and transient whites.

The average size of farms, as reported by the 1935 census, is 82.7 acres. This represents an increase over the average size in 1900, which was 77.4 acres, although it is not so large as that in 1880, which was 122 acres. In 1935, 92.4 percent of the farms included less than 175 acres each. Only 32 farms included 500 or more acres each.

It is commonly considered that a farm family with one team can work about 50 acres of cropland on such soils as Houston black clay and slightly less on other soils.

In 1935, 4,129, or 70.1 percent of the farms, were operated by tenants; 1,748, or 29.7 percent, by owners; and 14, or 0.2 percent, by managers. Tenancy has increased steadily, from 31.4 percent in 1880. Practically all of the farm leases call for a share of the crops as rent, either one-third of the feed crops and one-fourth of the cotton, with the tenant furnishing seed, work animals, and equipment; or one-half of the crops, with the landlord furnishing everything except labor. The same proportions hold whether the farm is of high or of very low productivity. Accordingly, the farms of low productivity are renting at a relatively higher price than the excellent farms. To some extent this is offset by the larger amounts of pasture land accompanying the poor farms. In the past, some tenants on excellent blackland farms have paid a cash bonus in addition to the crop-share rental. As a rule, the farms on the better soils are rented by the more progressive tenant farmers. Prairie meadows rent for one-half of the hay, and extensive pastures rent for amounts ranging from very little to 75 cents an acre. The prevailing system of 1-year crop-share tenancy, with its insistence on cash crops, causes a lack of incentive on the part of the tenant to engage in long-time plans for farm improvement.

Most of the farmhouses are unpainted four- or five-room frame buildings, but a few are substantial and well kept. Many of the tenant houses have only two or three rooms. The other farm buildings are small and unimportant, as livestock require little shelter and only small quantities of feedstuffs are stored. Even the farm machinery is not protected on many farms. The investment in machinery is small. As a rule, the farm equipment includes a middlebuster, a turning plow, a section harrow, a riding cultivator, a wagon, and various hand tools. The farm animals ordinarily include from two to four mules or draft horses, a cow or two, two or three hogs, and a few chickens.

SOIL-SURVEY METHODS AND DEFINITIONS

Soil surveying consists of the examination, classification, and mapping of soils in the field.

The soils are examined systematically in many locations. Test pits are dug, borings are made, and exposures, such as those in road or railroad cuts, are studied. Each excavation exposes a series of dis-

tinct soil layers, or horizons, called, collectively, the soil profile. Each horizon of the soil, as well as the parent material beneath the soil, is studied in detail; and the color, structure, porosity, consistence, texture, and content of organic matter, roots, gravel, and stone are noted. The reaction of the soil[4] and its content of lime and salts are determined by simple tests.[5] Drainage, both internal and external, and other external features, such as relief, or lay of the land, are taken into consideration, and the interrelation of soils and vegetation is studied.

The soils are classified according to their characteristics, both internal and external, especial emphasis being given to those features influencing the adaptation of the land for the growing of crop plants, grasses, and trees. On the basis of these characteristics, soils are grouped into mapping units. The three principal ones are (1) series, (2) type, and (3) phase.

The most important group is the series, which includes soils having the same genetic horizons, similar in their important characteristics and arrangement in the soil profile, and developed from a particular type of parent material. Thus, the series includes soils having essentially the same color, structure, and other important internal characteristics and the same natural drainage conditions and range in relief. The texture of the upper part of the soil, including that commonly plowed, may vary within a series. The soil series are given names of places or geographic features near which they were first recognized. Thus, Houston, Hunt, Wilson, and Kaufman are names of important soil series in this county.

Within a soil series are one or more soil types, defined according to the texture of the upper part of the soil. Thus, the class name of the soil texture, such as sand, loamy sand, sandy loam, loam, silt loam, clay loam, silty clay loam, and clay, is added to the series name to give the complete name of the soil type. For example, Wilson clay and Wilson clay loam are soil types within the Wilson series. Except for the texture of the surface soil, these soil types have approximately the same internal and external characteristics. The soil type is the principal unit of mapping, and because of its specific character it is usually the soil unit to which agronomic data are definitely related.

A phase of a soil type is a variation within a type, which differs from the type in some minor soil characteristic that may have practical significance. Differences in relief, stoniness, and the degree of accelerated erosion frequently are shown as phases. For example, within the normal range of relief for a soil type, there may be areas that are adapted to the use of machinery and the growth of cultivated crops and others that are not. Even though there may be no important difference in the soil itself or in its capability for the growth of native vegetation throughout the range in relief, there may be important differences in respect to the growth of cultivated crops. In such instances the more sloping parts of the soil type may be segregated on the map as a sloping or hilly phase. Similarly, soils

[4] The reaction of the soil is its degree of acidity or alkalinity expressed mathematically as the pH value. A pH value of 7 indicates precise neutrality, higher values indicate alkalinity, and lower values indicate acidity.

[5] The total content of readily soluble salts is determined by the use of the electrolytic bridge. Phenolphthalein solution is used to detect a strong alkaline reaction.

having differences in stoniness may be mapped as phases, even though these differences are not reflected in the character of the soil or in the growth of native plants.

The soil surveyor makes a map of the county or area, showing the location of each of the soil types and phases, in relation to roads, houses, streams, lakes, section and township lines, and other local cultural and natural features of the landscape.

SOILS AND CROPS[6]

Hunt County is occupied largely by smooth dark-colored productive soils. It lies wholly within the Texas blackland prairie. The Wilson and Crockett soils occupy a much larger proportion of the county, however, than they do in most counties of this prairie, and, in addition, isolated areas of light-colored sandy originally timbered soils, similar to those of the east-Texas timber country, are included.

About one-third of the county, the northwestern part, is a general area of highly productive smooth fertile black or nearly black limy or only slightly acid clay soils which possess physical characteristics favorable to good growth of crops. The rest of the county is a general area of moderately productive dark-gray or grayish-brown slightly acid sandy loam and clay loam soils, with compact subsoils. This area is interrupted by a few extensive isolated bodies of moderately acid light-colored sandy originally forested soils of low natural productivity. These light-colored sandy soils constitute about one-sixth of the total area of the county, and rich bottom-land soils occupy about one-fifth. The potential productivity of the bottom-land soils is high, but, in large areas, frequent overflows prevent successful crop production unless the land is protected by ditching or by construction of levees. At least two-thirds of the land in the county is very suitable for the growing of crops, and less than one-tenth is definitely unsuitable for that purpose.

The proportions of various soils in cultivation range from about 85 percent for the smooth heavy-textured soils of the prairies to almost none on the more rolling areas of light-colored sandy soils. The average farm income ranges from moderately high on the smooth heavy soils of the prairies to very low on the light-colored sandy soils. Cotton is an important crop on all the soils in cultivation, but

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[6] Owing to increased detail in soil mapping and refinements in soil classification in recent years, some of the soil names used in Hunt County do not correspond with names assigned to the same soils in earlier surveys of adjoining counties. Consequently, areas of some of the soils on the soil map of Hunt County do not match areas mapped along the Hunt County lines in Rockwall, Van Zandt, and Collin Counties. The following tabulation lists these differences:

Soil name in Hunt County:	Soil name in Van Zandt County:
Kirvin fine sandy loam Tabor fine sandy loam	Susquehanna fine sandy loam.
Kaufman clay	Trinity clay.
Kaufman clay loam	Ochlockonee silt loam.
Kaufman fine sandy loam	Ochlockonee very fine sandy loam.
Wilson very fine sandy loam, mound phase.	Wilson very fine sandy loam (inclusion).
Crockett very fine sandy loam, rolling phase.	Crockett very fine sandy loam (inclusion).
	Soil name in Rockwall County:
Wilson clay loam, slope phase Wilson very fine sandy loam	Wilson clay loam (inclusion).
	Soil name in Collin County:
Hunt clay	Houston black clay (inclusion).
Crockett very fine sandy loam, rolling phase.	Crockett very fine sandy loam (inclusion).

it occupies a larger proportion of the cropland on the smooth prairie soils than on the light-colored sandy soils. As cotton is much better adapted to the section than are other major farm crops, with the possible exception of improved pasture, it is one of the highest income-producing crops even on poor soils that are not especially suitable for its growth. The truck and fruit crops produced for sale are grown mainly on the light-colored sandy soils which are very responsive to good management.

The soils are grouped according to their general broad characteristics, as follows: (1) Heavy-textured soils of the prairies; (2) medium-textured soils of the prairies; (3) light-colored sandy soils; and (4) soils of the bottom lands. The first three are soils of the uplands that not only are related in many features but also are closely associated in parts of the county. They give rise to the general soil distribution indicated in figure 2. The soils of the bottom lands do not have regionalized distribution but occur as flood-plain areas throughout the county.

In the following pages the soils of the county are described in detail, and their agricultural relationships are discussed; their distribution is shown on the soil map which accompanies this report; and their acreage and proportionate extent are given in table 4.

TABLE 4.—*Acreage and proportionate extent of the soils mapped in Hunt County, Tex.*

Type of soil	Acres	Percent	Type of soil	Acres	Percent
Houston black clay	39,936	7.0	Kirvin fine sandy loam	31,232	5.5
Hunt clay	39,872	7.0	Tabor fine sandy loam	13,760	2.4
Austin clay	1,600	.3	Tabor loamy fine sand	1,984	.3
Wilson clay	44,608	7.8	Bowie loamy fine sand	2,816	.5
Houston clay	23,424	4.1	Lufkin very fine sandy loam, mound phase	22,400	3.8
Sumter clay	4,608	.8	Trinity clay	7,424	1.3
Sumter clay loam	4,544	.8	Kaufman clay	54,848	9.6
Wilson clay loam	89,792	15.7	Catalpa clay	512	.1
Wilson clay loam, slope phase	18,176	3.2	Kaufman clay loam	10,880	1.9
Wilson silt loam	12,928	2.3	Kaufman clay loam, high-bottom phase	7,616	1.3
Wilson very fine sandy loam	68,480	12.0	Kaufman fine sandy loam	8,192	1.4
Wilson very fine sandy loam, mound phase	5,504	1.0	Kaufman fine sandy loam, high-bottom phase	4,352	.8
Crockett very fine sandy loam	6,528	1.2	Ochlockonee loamy fine sand	1,344	.2
Crockett very fine sandy loam, rolling phase	29,056	5.1			
Crockett clay loam, eroded phase	15,104	2.6	Total	571,520	

HEAVY-TEXTURED SOILS OF THE PRAIRIES

The soils of this group, which are closely associated, have all or most of the following characteristics: Heavy black or nearly black calcareous or slightly acid clay surface soils, crumbly structure, large store of plant nutrients, high water-holding capacity, absence of a developed texture profile, and highly calcareous nearly impervious clay substratum. The rate of decrease in productivity is comparatively low wherever erosion is controlled, and the response to soil-improvement practices is somewhat slower than that of the soils of the other upland groups.

Three subgroups of soils having different capabilities for use may be distinguished, as follows: (1) Smooth heavy soils including Houston black clay, Hunt clay, Austin clay, and Wilson clay; (2)

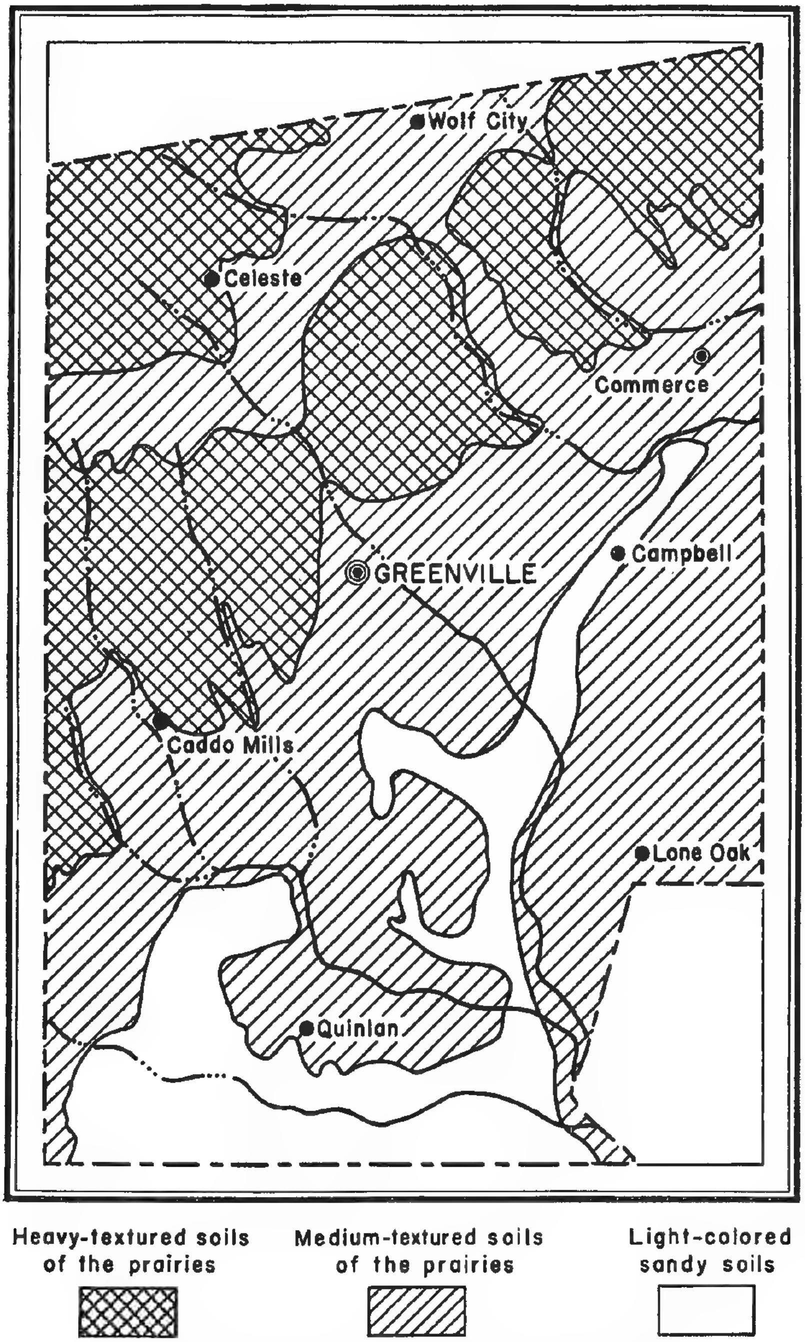

FIGURE 2.—Principal soil groups of Hunt County, Tex.

rolling heavy soils comprising Houston clay; and (3) steep eroded heavy soils including Sumter clay and Sumter clay loam. All smooth heavy soils are highly productive and are suited to a cropping system in which intertilled crops occupy the land most of the time. Houston clay, a rolling heavy soil, is moderately productive but is unsuited to such a cropping system, owing to excessive erosion. The Sumter soils are of low productivity and are generally unsuitable for the production of crops.

All the heavy-textured soils of the prairies originally supported a dense vegetation of tall prairie grasses. Before cultivation they had a microrelief, in which small depressions, locally known as hog wallows, alternated with slight ridges ranging from 10 to 15 feet apart and from 6 to 12 inches in height. On the smooth areas, the depressions were enclosed and held water following rains, but on the more sloping areas they were not enclosed and, together with the small ridges, extended up and down the slopes. The uneven surface slowly reappears in places where the soils remain uncultivated for several years.

The smooth heavy-textured soils of the prairies are the most productive upland soils in the county for cotton, corn, small grains, and sorghums. They are superior to the bottom-land soils because they have better drainage. They are the only soils of the upland on which alfalfa thrives. They are not especially adapted to most fruit and truck crops. The natural fertility of these soils is extremely high, and their productivity is retained to a remarkable degree, even after 50 years of clean cultivation and in the absence of systematic crop rotations, growth of legumes, or use of fertilizers. The average acre yields of cotton are reported to have declined considerably since the soils were first placed in cultivation, partly due to the decrease in fertility of the soils but largely due to the increased damage done by plant diseases and insects. The average yields of corn and oats have declined much less than have those of cotton. The soils still contain sufficient quantities of available plant nutrients that the response to applications of commercial fertilizers or to green manures is comparatively small. Almost any smooth field of these soils will produce a bale of cotton to the acre in exceptionally favorable seasons. One reason for the maintenance of the relatively high productivity is the general absence of leaching. Very little water passes downward through the substrata beneath these soils. Apparently the organic matter originally present was of very stable form, as the plowed surface soil in uneroded areas is just as dark colored as is the same layer in the virgin prairie.

Houston black clay.—Houston black clay is a deep smooth crumbly limy heavy blackland soil. To a depth ranging from 1½ to 5 feet, it consists of nearly black or black highly calcareous heavy clay which grades into brownish-yellow or gray highly calcareous clay containing numerous soft white lumps of calcium carbonate from ½ to 2 inches in diameter. Below a depth of about 10 feet, the soil is underlain by bluish-gray highly calcareous clay or marl—the parent material. Fine white particles of lime occur throughout the soil. Little difference exists within the topmost 3 inches. The upper 18 inches is more crumbly and less blocky than the material below.

This soil is an extremely heavy clay which, however, has good tilth and physical characteristics favorable for the vigorous growth of plants. In cultivated fields, when dry, the tilled surface layer is a loose mass of fine hard angular grains; below this the material breaks into hard irregular clods. Exposed clods naturally crumble to a loose mass of fine hard grains after thorough wetting and drying. The crumbly character is apparently due to the high coefficient of expansion and contraction on wetting and drying. After plowing, the surface soil is too loose for a good seedbed, until it has thoroughly settled. The soil absorbs and holds large quantities of moisture in forms available for plant growth, and crops resist drought as long as they do on any upland soil in the county. The large cracks which form when the material becomes dry have a maximum width of about 6 inches and a maximum depth of about 6 feet. They allow rapid penetration of water into the deeper soil layers. When the soil is moist and the cracks are closed, water is absorbed extremely slowly. Apparently this soil contains a good supply of organic matter.

The soil is very uniform. The chief variation consists of the wave-like change in thickness of the dark-colored surface soil, that is associated with hog wallows on the native prairie. The black layer ranges from 3 to 5 feet in thickness below the depressions but is only about 6 inches thick on the crests of the intervening swells of the original microrelief. This variation apparently does not affect the growth of crops, which is uniform throughout the fields.

The average thickness of the dark-colored layer also varies according to the slope. It is nearly uniform within the range from nearly level to 2 percent but gradually decreases with an increase of slope over 2 percent. Where the black layer is so thin that sufficient yellowish-brown clay is brought up by plowing to impart a dark yellowish-brown rather than a black color to the cultivated fields, the soil is differentiated as Houston clay instead of Houston black clay. The color limit between these two soils corresponds almost exactly with a surface slope of 3 percent.

In a few small areas, in the northern part of the county, where the underlying parent rock consists of chalk (white rock) rather than marl, the gradational layer between the dark-colored surface soil and the parent material is gray or cream colored rather than olive yellow and is thinner than the corresponding layer in the typical soil.

The relief of this soil is smooth and undulating. Surface drainage is good but not excessive, and there is practically no underdrainage. The slope of the surface ranges from nearly level to about 3 percent. Typically, owing to its smooth relief, this soil is not subject to severe erosion. The soil character, however, is such that unprotected moderately sloping areas erode readily, and in some areas gully and sheet erosion have caused severe damage. In places where the control of erosion is necessary, this can be effected at comparatively low cost without a major change in the cropping system.

Houston black clay is one of the extensive soils of the county. It is the typical "black waxy land" of the blackland prairie and is one of the most important soils in the State. It occurs as broad uniform areas which extend for many miles with only minor interruptions by strips of bottom land along small drainageways. Together with Hunt clay, which is very similar, it occupies about two-thirds of the typical

blackland section of this county. It occurs almost exclusively in the northern half, and the largest areas are in the vicinities of Celeste and Floyd.

About 85 percent of the total area of Houston black clay is in cultivation, and cotton occupies from one-half to three-fourths of the cropped land. At least two-thirds of the cropped land not in cotton is devoted to corn, and the rest is in oats, sorgo, grain sorghums, and, in some small fields, alfalfa and Sudan grass. During recent years several hundred acres have been devoted to onions, a high-yielding and well-adapted crop, and the same fields commonly produce a crop of cotton during the same year.

Under general farming practices, the average acre yields on Houston black clay are about 200 pounds of lint cotton, 20 bushels of corn, 30 bushels of oats, 3 tons of air-dry sorgo hay, 1 ton of native prairie hay, 2½ tons of alfalfa, and 125 bushels of onions.[7] The most productive fields produce average yields of about 225 pounds of lint cotton, 30 bushels of corn, and from 35 to 40 bushels of oats an acre. The maximum yields, those occasionally obtained from a very few fields during very favorable seasons, are about 1½ bales of cotton, 50 bushels of corn, and 80 bushels of oats an acre. Near or complete crop failures are rare, and near failures of corn occur more frequently than of cotton. According to farmers, the productivity of new land (small areas of this soil which have previously been used only for native prairie meadow or pasture) is slightly, but not more than one-fourth, greater than that of smooth fields that have been cropped for 50 years. Applications of commercial fertilizers have resulted in decidedly variable increases in crop yields and have not proved generally profitable over a period of years. This is a very productive soil, and it is one of the most highly valued soils in the county.

Hunt clay.—Hunt clay is a deep smooth crumbly heavy blackland soil. In appearance it is almost identical with Houston black clay, from which it differs chiefly in chemical reaction and content of lime. Most farmers do not distinguish between the two soils. Although Hunt clay contains sufficient lime for all crops, the surface layer is slightly acid or neutral in reaction, and the soil contains no free carbonates to a depth ranging from 12 to 40 inches. Hunt clay can best be distinguished from Houston black clay by testing for free carbonates with dilute hydrochloric acid. It also can be identified by the presence of a few iron oxide concretions, the vagrant occurrence of cellular indurated concretions of impure calcium carbonate, and the trace of a gray crust that forms on the surface after a heavy rain. The two soils are utilized for the same crops and, so far as can be learned, they have the same productivity, crop adaptations, and general agricultural value.

Hunt clay consists of black or nearly black noncalcareous heavy clay which is extremely plastic and sticky when wet. Free carbonate of lime occurs at a depth ranging from 12 and 40 inches, below which all the soil material is calcareous. The dark-colored soil ranges from 3 to 5 feet in thickness and is nearly uniform throughout. It grades into dull-yellow or olive-yellow highly calcareous extremely plastic

[7] All crop yields given are estimates carefully made from information obtained from local farmers, census data, and agricultural research and demonstration authorities working within the county.

heavy clay containing a few lumps of soft white calcium carbonate, from one-half inch to 2 inches in diameter. This material grades, at a depth ranging from 5 to 10 feet, into the parent material, an olive-yellow or bluish-gray compact impervious highly calcareous clay which, however, does not contain segregated spots of calcium carbonate.

Although this soil is an extremely heavy clay, it is characterized, like Houston black clay, by good tilth and physical characteristics that favor the vigorous growth of crops. Plant roots thoroughly permeate the soil material, although the larger roots tend to follow larger cracks that form when the soil dries and contracts. The cultivated surface soil, when dry, is a loose mass of fine hard angular grains, about one thirty-second of an inch in diameter, which rest on large very hard clods. In most fields the plowed layer is immediately underlain by a faintly developed plow sole, a layer about 2 inches thick, within which the material is faintly laminated and slightly more dense and compact than the underlying material. The soil does not shed from tillage implements, and plows do not scour. A fragile crust, about one-half inch thick and consisting of fine grains adhering to one another, forms on the surface when it becomes dry following heavy rains; but this crust is broken by cracks, caused by contraction of the soil material, into fragments not more than 3 inches in diameter, and in general it does not interfere with the emergence of newly planted crops. In places, especially in areas gradational toward Wilson clay, the crust has a thin surface film of gray siliceous material, but a cross section of the film is too thin to be visible to the naked eye.

In the virgin prairie, the uppermost one-half inch of soil, when dry, is a mass of very fine angular grains. It overlies a layer of irregular sub-round very hard aggregates, from three-eighths to three-fourths of an inch in diameter, which are held together by plant roots as large porous clods. This coarsely granular material grades, at a depth of about 18 inches, into a layer composed of very hard clods separated by ¼- to 3-inch cracks caused by contraction. The cracks reach a depth of about 5 feet, which is slightly below the base of the dark-colored layer. The material below a depth of 5 feet is either massive or shaly. A very few black hard crystalline shotlike pellets of iron oxide occur on the surface and throughout all soil layers.

The principal variation in Hunt clay is the wavelike change in thickness of the black layer, that is associated with the hog wallows on the native prairie—the same variation as in Houston black clay. In gradational areas toward Houston black clay the content of calcium carbonate likewise varies according to the original microrelief; the soil of the hog wallows is noncalcareous, and that of the intervening swells is calcareous. In typical areas the surface soil is noncalcareous, both in depressions and on the swells. In order to allow consistent identification, the demarcation between Hunt clay and Houston black clay is placed at the point where application of dilute hydrochloric acid to a compacted impression, 1 inch in diameter, in a moist average specimen of surface soil gives visible effervescence. In places, the surface soil of Hunt clay contains a few cellular hard almost white concretions of impure calcium carbonate. The average

thickness of the black layer bears the same relationship to the slope in Hunt clay as it does in Houston black clay.

The relief is smooth and undulating. Surface drainage is good but not excessive. The slope of the land ranges from nearly level to about 3 percent. Owing to its smooth relief, this soil, where typically developed and situated, is not subject to severe erosion. The soil character, however, is such that it erodes severely on unprotected moderate slopes, and in many areas gully and sheet erosion have caused considerable damage. In places where the control of erosion is necessary, it can be effected at a comparatively low cost and without a major change in the system of agriculture.

Hunt clay is one of the extensive soils of the county. It occurs throughout the blackland sections as broad areas and as gradational bands between Houston black clay and Wilson clay. The largest areas are near Caddo Mills, Celeste, Tidwell, Aberfoyle School, and Yowell, and west of Greenville. It ranks about equally with Houston black clay as one of the two most productive and most highly valued soils in this county.

About 85 percent of the total area is in cultivation, and cotton occupies from one-half to three-fourths of the cropped land. At least two-thirds of the cropped land not in cotton is devoted to corn; and the small remainder is occupied by sorgo, oats, grain sorghums, and very small acreages of alfalfa and Sudan grass. Onions are grown on several hundred acres of this soil during most years. The average acre yields under average farm practices are about 200 pounds of lint cotton, 20 bushels of corn, 30 bushels of oats, 2½ tons of air-dry sorgo hay, 2½ tons of alfalfa, and 125 bushels of onions. Some farms produce average yields of 225 pounds of lint cotton, 30 bushels of corn, and from 35 to 40 bushels of oats. The maximum yields obtained during the last 20 years on any fields of this soil are about 1½ bales of cotton, 50 bushels of corn, and 80 bushels of oats to the acre. The productivity of smooth fields that have been clean cropped for 50 years is said to be only slightly less than that of new land.

Austin clay.—Austin clay is a friable blackland soil underlain by chalky material at a depth ranging from 2 to 3½ feet. The surface soil, to a depth ranging from 12 to 18 inches, consists of granular very crumbly friable calcareous black or nearly black clay which grades downward into gray or dark-gray friable cloddy calcareous clay. At a depth of about 24 inches this material, in turn, grades into gray or light grayish-brown highly calcareous friable clay containing almost round spots of cream-colored chalky clay. This grades, at a depth ranging from 24 to 42 inches and averaging about 36 inches, through partly weathered chalk into whitish chalky limestone—the parent material. The surface soil is friable and not crusty, and the material is not so heavy or so sticky as that of Houston black clay. In cultivated fields the surface layer is a loose mulch of very fine crumbs. The material below the tilled soil is granular, and, when dry, it separates into roundish pellets, about one-eighth inch in diameter, which are coated with dull-black films. In places the immediate surface layer is not calcareous, and, where it contains no free carbonate, the reaction is neutral. The lower soil layers are highly calcareous throughout.

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The thickness of the various soil layers varies from place to place. A few small areas of grayish-brown highly granular calcareous clay underlain by chalk at a depth of less than 18 inches are included with mapped areas of this soil. These areas would have been mapped as Austin clay, shallow phase, had their size warranted such a separation. The soil in areas indicated on the soil map with rock outcrop symbol is very shallow—less than 10 inches deep—over chalk. A few included areas amounting to less than 5 percent of the total area have a clay loam surface soil. In a small area northwest of Celeste the soil is not highly granular and would be separated as Houston black clay, shallow phase, were it not of so slight extent. Austin clay in Hunt County is darker than is characteristic of the Austin soils occurring elsewhere.

The surface of this soil is smooth and well drained. The slope ranges from nearly level to about 3 percent. The underlying bed of chalk is slowly permeable to water, but the soil has some underdrainage. Well water is obtainable in places at a depth ranging from 10 to 40 feet. This soil is of slight extent. It occupies small isolated areas within a narrow belt extending from Whiterock to a point northeast of Midde Sulphur School in the northern part of the county. This belt corresponds to the outcrop of the Pecan Gap chalk formation. In most areas the native vegetation was grassland of coarse grasses, with an open growth of small elm, hackberry, bois d'arc, and some oak trees. In some areas the native vegetation probably consisted entirely of tall prairie grasses.

Austin clay is good land for the production of crops, and its crop adaptations and utilization are similar to but not identical with those of Houston black clay. In areas where the soil material is less than 30 inches thick over chalk, yields of crops decrease sooner and to a greater extent during dry weather than they do on Houston black clay. The Austin soil apparently is less well suited to corn than is the Houston soil, and oats constitute the principal feed crop grown. About two-thirds of the total area is in cultivation. Cotton occupies about two-thirds of the cropped acreage, oats about one-fifth, sorgo about one-tenth, and corn practically none. The average acre yields are about 180 pounds of lint cotton, 25 bushels of oats, 15 bushels of corn or grain sorghums, and 2 to 2½ tons of sorgo.

Wilson clay.—Although Wilson clay is sometimes referred to as "tight land" or "rawhide land," it is generally known in this county as "black land," although it commonly is recognized as being less black and less crumbly than Houston black clay and Hunt clay. The 12-inch surface soil is dark-gray or very dark gray tough compact crusty noncalcareous clay. It grades into dark-gray extremely tough cloddy noncalcareous clay which, at a depth of about 36 inches, grades through a transitional zone, not over 3 inches thick, into dull-yellow compact calcareous clay containing fine white particles of calcium carbonate. With increasing depth the material becomes more highly calcareous and the color changes to gray because of an increase in the number of gray splotches. The parent material, a gray moderately calcareous compact shaly clay, is reached at a depth of about 6 feet. The reaction is strongly acid to a depth of 12 inches, below which the acidity decreases. The pH value at a depth of 18 inches is about 6 and, below a depth of about 24 inches, the material is neutral to alkaline.

In dry cultivated fields, this soil has a distinct gray cast which readily distinguishes it from Houston black clay and Hunt clay. When wet, the surface soil of Wilson clay is almost black with a gun-metal hue.

On drying thoroughly, this soil forms a rather hard crust which is especially dense following hard rains. This crust frequently interferes with emergence of young plants and causes poor stands. It is about one-fourth inch thick, consists of very fine crumblike grains weakly bound together, and is underlain, to a depth of about 2 inches, by a loose mass of crumblike grains that are finer than those in the topmost layer of Houston black clay. The surface of the crust is a film of almost white siliceous material, with protruding pellets of dark soil. The film is thick enough to be visible in cross section to the naked eye. Below the surface mulch the material is compact and cloddy, and where exposed, as in roadside cuts, it breaks apart, on drying, to angular fragments. The material between depths of about 18 and 36 inches is somewhat more compact and tough than that in either the underlying or overlying layers.

The physical characteristics of this soil are slightly less favorable to the vigorous growth of crops than are those of Houston black clay. Farmers' reports and field observations indicate that crops do not withstand droughty conditions so well on this soil as on the Houston soil. The soil is more intractable, and it must be worked under proper moisture conditions, as the clods do not crumble so readily with wetting and drying as do those of the Houston soil. When the moisture conditions are exactly right, tillage implements will scour in this soil. Fewer and smaller cracks are formed on drying than in the Houston soil.

The texture of Wilson clay ranges from heavy clay to light silty clay, the coarser textured areas being those adjacent to Wilson clay loam. A few areas include small spots, from 10 to 20 feet in diameter, of similar soil which consists of a 3-inch layer of dark grayish-brown noncalcareous friable silty clay loam that grades into gray or dark-gray very tough noncalcareous clay mottled with reddish brown. On the more sloping but small areas of Wilson clay, where the slope exceeds 2 percent, small spots and slopewise streaks of Houston clay are included. These represent the ridges between the hog wallows which characterized the original microrelief.

Wilson clay occurs largely as broad gradational bands between areas of Hunt clay and Wilson clay loam. The parent material is moderately calcareous compact marine clay, with a lower content of calcium carbonate than is present in the parent materials of Houston black clay and Hunt clay. The native vegetation is mainly tall prairie grasses, including a rather large proportion of three-awn grasses.

The slope ranges from level to about 3 percent; less than one-fifth of the total area has a slope greater than 2 percent. The relief averages slightly smoother than that of Houston black clay and Hunt clay. Most of the areas are adequately but slowly drained, although a few bodies, amounting to about 10 percent of the total area, are so nearly level that drainage is inadequate for the best growth of crops during some wet seasons. This soil has practically no underdrainage, as the substrata are almost impervious.

About four-fifths of the land is in cultivation. Cotton occupies about three-fourths of the cropped area, corn about one-sixth, and oats about one-fifteenth. The average acre yields under general farming practice are about 180 pounds of lint cotton, 15 bushels of corn, 25 bushels of oats, between 15 and 20 bushels of grain sorghums, and 2 or 2½ tons of sorgo forage. Yields of cotton are about the same as those obtained on Houston black clay during wet years but are considerably lower during dry years. Yields of corn are lower than those on Houston black clay during all years and during dry years are practically failures. The maximum yields of all crops are lower than those obtained on Houston black clay. In general, this soil has not responded profitably to applications of commercial fertilizers. The infestation with cotton root rot is, as a rule, much lower than that on the other heavy-textured soils of the prairies. It was estimated at less than 1 percent in 1933, and most of the slight infestation was on the more rolling areas which included spots of Houston clay. Wilson clay is good land for the production of crops and generally is valued at about two-thirds as much as similarly located and improved Houston black clay.

Houston clay.—Houston clay is rolling blackland. It differs from Houston black clay in that it is more shallow, more sloping, and less dark. The surface soil, which ranges from 8 to 24 inches in thickness, consists of brown, dark yellowish-brown, or yellowish-brown highly calcareous crumbly heavy clay. This grades into brownish-yellow or olive-yellow plastic highly calcareous clay which grades, at a depth ranging from 3 to 5 feet, into bluish-gray or yellow compact very highly calcareous clay identical with that underlying Houston black clay. The cultivated fields are dark brown spotted with yellow in places where the underlying yellow clay comes to the surface on the sites of the slight ridges between the hog wallows which characterize the original microrelief. Most of these yellow streaks extend up and down the slopes. In places the surface soil is just as black as that of Houston black clay, but it is so thin that, when plowed, large quantities of the underlying yellowish-brown clay are intermixed, and a brown rather than a black color is imparted to the fields. The thickness of the soil is variable and decreases with increase in slope of the land. A few areas, occurring at the bases of slopes, have a 3-foot surface soil of brown or dark-brown calcareous material overlying yellow clay. In many areas adjacent to the Wilson soils, such as those near Commerce and Lone Oak, the surface soil in places is noncalcareous to a depth ranging from 12 to 24 inches.

The relief of this soil is rolling, and the land is cut by numerous headwater drains. The range of the slope is from about 3 to 8 percent. The slopes are steeper than those of Houston black clay but less steep than those of Sumter clay. Surface drainage is excessive, and all fields are subject to severe erosion except those few that are adequately protected by broadcast crops and by terraces. Practically all areas have been severely damaged by both sheet and gully erosion.

Houston clay is less extensive in this county than in most counties of the blackland prairie. It is associated with Houston black clay and other blackland soils on slopes along the major drainageways.

The largest areas are in the vicinities of Lane and Indian Creek School in the northwestern part of the county.

This is a good soil for the production of crops but not so good as is Houston black clay. On account of its rolling relief, which promotes soil erosion, it is not well suited to the prevailing cropping system, in which clean-tilled crops occupy the fields most of the time. Originally much of this soil produced yields nearly as high as those obtained on Houston black clay, according to local reports, but its productivity has decreased much more and is now probably only about two-thirds as high as the productivity of that soil. It is utilized for the same crops as those grown on Houston black clay, with a slightly lower proportion in corn and a slightly higher proportion in oats and sorgo. About one-half of the total area is in cultivation, about one-tenth is in native-prairie meadow, and the rest is mostly abandoned-field pasture. Acre yields of about 140 pounds of lint cotton, 25 bushels of oats, 12 bushels of corn, 10 to 15 bushels of grain sorghums, and 1½ to 2 tons of sorgo are obtained. The productivity varies widely among different fields on this soil, depending on the length of time the land has been in cultivation and the present management.

Although the soil is not highly responsive to soil amendments, the productivity of most fields has decreased to the point where the use of green manures, cover crops, and, possibly, commercial fertilizers might prove profitable. The soil is suited to a cropping system in which close-growing or broadcast crops occupy the land most of the time and protect it from erosion. All areas in cultivation erode, and for best results it is considered advisable to terrace the land. About one-fourth of it is terraced, but many of the terraces are poorly constructed and have inadequate outlets.

Sumter clay.—Sumter clay is the steeply sloping eroded brownish-yellow calcareous clay of the blackland section, locally known as "yellow clay hills." The surface soil, which ranges from 8 to 18 inches in thickness, consists of brownish-yellow or olive-yellow highly calcareous very plastic but crumbly heavy clay. This grades into the raw parent material of olive-yellow or bluish-gray highly calcareous compact platy clay or marl. The areas mapped as Sumter clay originally were occupied by Houston clay, from which 12 or more inches of the dark surface soil have been washed away. This erosion, for the most part, has taken place since these steeper areas have been put into cultivation. At present, Sumter clay occurs in its native prairie condition in only very small areas which have a slope greater than 20 percent and which are confined to the sides of V-shaped headwater drains. Prior to cultivation, the soil probably did not occur in areas exceeding 1 acre each.

The soil is extremely plastic and sticky, and, when dry, it crumbles to a loose mass of coarse grains very similar to those in the surface layer of Houston black clay. Small areas mapped near Sullivan and Prairie Valley Schools, in the southeastern part of the county, are noncalcareous, crusty, and compact. These included bodies represent areas of Ellis clay which were too small to show separately on the soil map.

The relief of Sumter clay is steeply sloping and gullied. Generally the slope ranges from about 6 to 12 percent. In most areas, the

slopes are so steep and drainage so excessive that erosion cannot be economically and effectively controlled in cultivated fields. The soil occurs as narrow belts of steep slopes intermixed with smoother good agricultural land. The largest bodies are in the extreme northwestern part of the county.

Sumter clay is so subject to erosion that it is not well suited to the growing of crops. For the most part, this land never should have been placed in cultivation but should have been utilized for pasture or meadow. When first used for crops, it was productive. Yields decreased rapidly, however, with cultivation, and they now are less than one-half of those obtained on Houston black clay. Most of the fields have been abandoned and are now waste land or are utilized for the scant pasturage they afford. Less than one-fourth of the total area is under cultivation, and this includes most of the less steeply rolling and least eroded land. Similar areas on which the native sod never was destroyed are still producing good yields of native-prairie hay, averaging about 1 ton to the acre. Cotton occupies about two-thirds of the small area in cultivation, oats and sorgo occupy about one-sixth each, and corn seldom is grown. The productivity is extremely variable from field to field, but acre yields range from about 75 to 125 pounds of lint cotton, 10 to 20 bushels of oats, and 1 to 2 tons of sorgo forage. The carrying capacity of the abandoned-field pastures is very low. It can be estimated only roughly at about 20 acres per cow. The soil responds slowly to soil-improvement practices, and applications of barnyard manure or commercial fertilizers, as well as the practice of green manuring, have resulted in some increases in productivity. The carrying capacity of the pastures can be increased greatly by the establishment of good stands of desirable grasses and by mowing, in order to control undesirable weeds. Sweetclover, buffalo grass, Bermuda grass, and burclover are some of the more desirable and adapted pasture plants.

Sumter clay loam.—The 10-to 20-inch surface soil of Sumter clay loam consists of brownish-yellow calcareous friable clay loam. It grades into raw calcareous yellow sandy clay which in places is highly glauconitic. This soil is much more friable and less sticky than is Sumter clay. In areas that never have been cultivated the surface soil, to a depth ranging from 4 to 15 inches, is dark-brown highly granular friable clay loam or sandy clay loam. The soil, as mapped, is extremely variable and includes many small areas of Crockett very fine sandy loam, rolling phase.

The relief is broken and gullied, and the slope ranges from about 6 to 15 percent. The soil occupies narrow steep slopes associated with smooth good agricultural land. Drainage is excessive, and soil erosion is severe on all cultivated areas. The largest bodies are a few miles south of Wolfe City and west of Lone Oak.

This soil is too erosible to be generally adapted to cultivation and should be utilized largely for pasture or meadow. Approximately one-tenth of the total area is now in cultivation. An additional one-half of the land has been in cultivation and was later abandoned. The value and adaptation of this soil are much the same as for Sumter clay. Cotton occupies most of the small area cropped and produces an average yield of about 75 pounds of lint to the acre. The original vegetation was of a mixed timber and prairie

type. Native pecans grow in the vicinity of Lone Oak, in places where the ground water table is within reach of tree roots. Such areas might prove to be good sites for pecan orchards if the fertility were increased by the use of green manures.

MEDIUM-TEXTURED SOILS OF THE PRAIRIES

This group includes soils with dark-gray or grayish-brown friable crusty acid medium-textured surface soils underlain by dense compact noncalcareous heavy clay subsoils. These are Wilson clay loam; Wilson clay loam, slope phase; Wilson silt loam; Wilson very fine sandy loam; Wilson very fine sandy loam, mound phase; Crockett very fine sandy loam; Crockett very fine sandy loam, rolling phase; and Crockett clay loam, eroded phase. All except the last two are smooth moderately productive soils. Owing, at least in part, to the dense clay subsoils, crops, especially corn, frequently are damaged by periods of dry weather. These soils contain a smaller supply of organic matter and available plant nutrients than do the smooth heavy-textured soils of the prairies. On drying they do not crack and crumble nor do they have the hog-wallow relief in the virgin prairie as do the heavier soils. They support a different flora of smaller prairie grasses than do the heavy soils.

Under cultivation, the productivity of these soils has dropped to a much greater extent than has that of the smooth heavy-textured soils of the prairies, and the response to soil-improvement practices probably will be greater than on those soils. Applications of commercial fertilizers, green manuring, and crop rotations including legumes probably would result in increased yields. These soils are considerably less productive for corn than are the heavy-textured soils of the prairies, but they are almost as productive for small grains. In general, it appears that these soils are not well suited for alfalfa or sweetclover, because they probably are too acid and would not provide sufficient moisture in dry seasons.

This is the most extensive soil group of the county. The dominant and more typical representatives of the group are Wilson clay loam and Wilson very fine sandy loam.

Wilson clay loam.—Wilson clay loam is locally known as "mixed land" or "gray land," but in other parts of Texas the same soil is known as "rawhide land." The surface soil is dark-gray friable moderately acid clay loam or silty clay loam, from 3 to 8 inches thick. When wet, this material is decidedly dark, in places almost black, but on drying it assumes an ash-gray shade on the surface. In cultivated fields the plowed soil is slightly less dark than the underlying material. The surface soil grades into dark-gray moderately compact acid clay. This upper part of the subsoil is less compact and slightly darker than the underlying material, and on drying it breaks naturally into irregular moderately hard aggregates, about three-fourths of an inch in diameter. This material grades at a depth of about 15 inches into gray slightly acid or neutral extremely tough blocky clay. The lower part of the subsoil is almost massive in place. When broken apart, the mass separates into large irregular extremely hard and tough clods. At a depth of about 36 inches the subsoil gives way to lighter gray very compact noncalcareous heavy clay, and this grades at a depth of about 72 inches, into the parent material con-

sisting of gray or yellowish-gray platy slightly to moderately calcareous clay containing a few soft concretions of calcium carbonate. The parent material is somewhat less compact than the overlying material. The concretions of calcium carbonate become less abundant with depth and are not present in the unaltered parent material. The material in the surface soil and upper subsoil layer ranges from medium to strongly acid. The acidity gradually decreases with depth, and at a depth of about 30 inches the reaction is neutral. Both surface soil and subsoil contain faint rusty-brown stains which appear to be segregations of iron compounds.

On drying after rains, the soil forms an ash-gray moderately hard ¼-inch crust, consisting of a tightly bound mass of crumblike grains, which interferes with emergence of newly planted crops. The surface of the crust is slick, with protruding pellets of dark soil, and it is coated with a white film about one-sixteenth of an inch thick. The crust rests on a loose layer, about 2 inches thick, of very fine crumbs which are much smaller than the grains in the tilled surface soil of Houston black clay. In the virgin prairie, the surface layer, to a depth of 2 inches, is massive or faintly platy, and the rest of the material is friable, cloddy, and faintly granular. It breaks apart to moderately hard clods, from 2 to 3 inches in diameter, which have a bumpy or granular surface. All structure particles are coated with a thin film of gray leached material.

No gray layer occurs at the contact between the surface soil and subsoil, and the transition between the two layers is gradual. Although this soil crusts on the surface, it is friable and works down to an excellent tilth when cultivated within a moderately wide range of moisture conditions. Tillage implements will scour, and tillage operations require slightly less power than they do on the heavy soils of the prairies.

This soil is essentially uniform. The principal variation consists of slight differences in the thickness of the surface soil. A few areas adjacent to light-colored sandy soils have a sandy clay loam surface soil. In such areas, the surface crust, which forms on drying, is harder than in areas of the typical soil.

Wilson clay loam is the most extensive soil in the county. It occurs in broad uniform areas throughout the southeastern two-thirds. The land ranges from level to a 3-percent slope, but at least three-fourths of the area has a slope of less than 2 percent. Most bodies have adequate but slow surface drainage. In a few areas drainage is slightly deficient, but this condition does not greatly decrease the productivity. The subsoil and substrata are very nearly impervious, and there is practically no internal drainage. The soil material appears the same in both the well-drained and slowly drained areas, except that it is faintly darker in the latter. The strongly sloping areas are indicated on the soil map as a slope phase. The typical soil is not subject to severe erosion.

Wilson clay loam is good cropland of moderately high productivity. Although it still contains a fairly good supply of available plant nutrients, continuous cropping has caused a decided reduction in productivity in places where little effort has been made to maintain fertility. During very favorable seasons, yields are not so high as on Houston black clay. During normal seasons, yields of cotton are only

slightly lower and during dry years they are materially lower than those obtained on Houston black clay. Moisture conditions in general are unfavorable for good yields of corn. About 75 percent of the total area is in cultivation. Cotton occupies about three-fourths of the cultivated area, corn about one-tenth, oats about one-eighth, and sorgo and grain sorghums most of the rest. Under general farm practice, the average acre yields are about 150 pounds of lint cotton, 13 bushels of corn, 25 bushels of oats, 15 bushels of grain sorghums, and 2 tons of sorgo forage. Average yields of 200 pounds of lint cotton an acre and correspondingly higher yields of other crops are obtained on a few of the more productve farms.

Wilson clay loam, slope phase.—Wilson clay loam, slope phase, has a dark-gray friable slightly acid to neutral clay loam surface soil which is underlain at a depth of about 5 inches by the upper subsoil layer of dark-gray moderately compact noncalcareous clay. This passes, at a depth of about 15 inches, into a more compact lower subsoil layer of dark-gray noncalcareous very dense and tough cloddy clay, and this layer, in turn, grades, at a depth of about 30 inches, into mottled yellow and gray compact calcareous clay containing a few concretions of calcium carbonate. Although shallower, this soil is much the same as the typical soil, from which it differs principally in having sufficient slope (between 3 and 6 percent) to cause severe erosion in cultivated fields. This sloping soil is less uniform than the typical soil. It includes small bodies of Wilson clay and Houston clay.

Owing to its more sloping relief and generally more eroded condition, this soil is less productive and less valuable farm land than is the typical soil. About one-half of the total area is in cultivation, and a few fields have been abandoned. Cotton occupies about three-fourths of the cultivated area; oats and sorgo, most of the remainder; and corn, practically none. The acre yields are approximately 100 to 125 pounds of lint cotton, 20 bushels of oats, 1½ to 2 tons of sorgo forage, and 10 to 15 bushels of grain sorghums.

Wilson silt loam.—Wilson silt loam is very similar to Wilson clay loam. It differs from that soil only in its slightly less heavy texture. The 12-inch surface soil consists of dark-gray friable moderately acid silt loam which grades, through a 4-inch transitional layer of dark-gray friable silty clay loam, into the dark-gray slightly acid very compact cloddy clay upper subsoil layer. The upper subsoil layer reaches to a depth of about 30 inches where it grades into gray or light-gray noncalcareous tough clay that gives way, at a depth of about 6 feet, to the light-gray or yellowish-gray calcareous slightly less compact clay parent material. Soft rusty-black concretions of iron oxide are present below a depth of 4 feet. Although the surface soil crusts on drying, as in Wilson clay loam, it is very friable when moist.

The surface of this soil is smooth, and the range of slope is from nearly level to about 1 percent. Drainage is very slow but is adequate in most areas; but in some, especially those in the vicinity of Dixon, it is slightly deficient. There is practically no underdrainage, as the subsoil is dense and compact. The soil occurs chiefly on high flat areas resembling old stream terraces, particularly on the northeastern side of the two forks of Sulphur River.

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This is good cropland and lies mainly within good farming communities. Its agricultural relationships are similar to those of Wilson clay loam, but it is a slightly better soil for garden crops. About 85 percent of the total area is in cultivation. Cotton occupies about three-fourths of the cropped area, corn about one-eighth, and oats about one-tenth. The comparatively high proportion of the land (for a medium-textured prairie soil) in corn is partly due to its occurrence on farms that have no bottom-land soils. Cotton yields about 165 pounds of lint to the acre, corn 15 bushels, oats 25 bushels, grain sorghums 15 bushels, and sorgo forage 2 tons. The slightly higher average yields obtained on this soil than on Wilson clay loam are the result of its uniformly very smooth relief and because of its occurrence within communities where good farming practices prevail.

Wilson very fine sandy loam.—Wilson very fine sandy loam locally is referred to as "gray sandy land" or "sandy prairie." In virgin areas, the 8- to 18-inch surface soil consists of dark-gray moderately acid friable very fine sandy loam. The cultivated surface soil is gray or grayish brown. It is considerably lighter in color than the material below plow depth or than the surface soil in virgin areas. In very dry cultivated fields, the surface appears ash gray. Although crusty like Wilson clay loam, the surface soil is friable and has a fine-crumb structure. The undisturbed material below plow depth is porous, although it is almost massive and breaks into moderately hard clods from 2 to 3 inches in diameter. The clods have bumpy or nodular surfaces, which is a characteristic of incipient granulation. The surface soil grades through a very thin transitional layer into the upper subsoil layer which consists of dark-gray moderately acid compact clay containing a very few splotches or specks of rusty red. The material in this layer breaks out as very hard irregular clods from 1 to 2 inches in diameter. The layer is approximately 7 inches thick and grades into dark-gray very compact noncalcareous clay that breaks into slightly larger clods. At a depth of about 30 inches, this clay, in turn, grades into gray or yellowish-gray noncalcareous slightly less compact clay. The yellow calcareous slightly sandy clay parent material underlies the soil at a depth of about 7 feet below the surface.

Wilson very fine sandy loam is one of the most extensive soils in the county. It occupies broad smooth areas throughout the southeastern section. The soil is comparatively uniform in its occurrence. The chief variations are slight differences in thickness of the surface soil, compactness of the subsoil, and prevalence of reddish-brown spots in the upper subsoil layer. Some of the flattest areas have practically no reddish-brown splotching in the upper part of the subsoil.

Some areas, especially those in the prairie that stretches from Merit to Wolfe City, include scattered small slick or salty spots which are unproductive. These spots, locally known as "glady spots" or "salt licks," are characterized by the formation of an almost white saline vesicular surface crust; the extremely dense character and generally yellow color of the clay subsoil which is much more compact than that of the surrounding areas of typical soil and lies closer to the surface; the abundance of iron concretions; the vagrant occurrence of conspicuous greasy black films; the puddled and viscous subsoil; and the poor growth of all types of vegetation. These slick spots

range from 10 to 40 feet in diameter, are most numerous around heads of drainageways or at the bases of slight slopes, and are worthless as cropland. No practical method of reclamation is known, and the spots are not sufficiently extensive to be generally of material importance. They constitute less than 2 percent of any one soil area.

Areas included with this soil around Quinlan and Williams Chapel and parts of other areas immediately adjacent to light-colored sandy soils have a fine sandy loam instead of a very fine sandy loam surface soil. In such areas the tendency for the soil to crust is greater than elsewhere.

The surface is flat or gently undulating, and the slope ranges between level and about 3 percent. Only a small proportion of the land has a slope of more than 2 percent. Other similar and associated sandy prairie soils, which have a slope generally greater than 3 percent and which have a developed reddish-brown upper subsoil layer, are correlated with the Crockett soils. Wilson very fine sandy loam is adequately, although slowly, drained, and water does not stand on the surface for extended periods following rains. For the most part, the soil is so smooth that it is not subject to severe erosion, and none of it has washed so severely as to ruin the land.

Wilson very fine sandy loam is fairly good cropland, and it probably is a better soil than is commonly reputed. Where farmed with little attempt to maintain productivity, yields have decreased much more than on similarly farmed Houston black clay. About 70 percent of the total area is in cultivation. Cotton occupies about three-fourths of the cropped acreage, corn one-tenth, and oats one-seventh. The acre yields are about 120 pounds of cotton lint, 10 bushels of corn, 20 bushels of oats, 10 to 15 bushels of grain sorghums, and 1½ to 2 tons of sorgo forage. On new land, however, or on those very few small fields where the fertility has been maintained, the average yield of cotton is almost one-half bale to the acre. This soil responds moderately well to soil-improvement practices, and its original fertility can be restored by the use of green manures, cover crops, commercial fertilizers, and rotations including legumes. Its physical characteristics are comparatively favorable, it is friable and easily worked, the surface soil absorbs moisture readily, and the subsoil is not extremely compact.

Wilson very fine sandy loam, mound phase.—Areas of Wilson very fine sandy loam, mound phase, include numerous low nearly round sandy mounds. In most cultivated fields the surface soil has received much fine sand through the distribution of the coarser material from the sandy mounds. It is gray or dark gray but is slightly less dark than that of the typical soil.

The mounds range from 20 to 100 feet in diameter and from 8 inches to 2 feet in height. They constitute from one-tenth to one-half of the total area of this soil. The surface soil on the mounds is lighter in both texture and color than in the typical soil. On the crests of the mounds the surface soil consists of a 10-inch surface layer of grayish-brown acid light fine sandy loam grading into dull-yellow or brownish-yellow fine sandy loam or loamy fine sand. At a depth ranging from 18 to 36 inches, this material rests abruptly on the subsoil of grayish-yellow acid plastic clay mottled with red. The mounds constitute a thickening of the surface soil; the top of the

clay subsoil lies at about the same level below the mounds and the intervening flats. The mounds are noticeable in cultivated fields as light-brown or yellowish-brown spots, on which the growth of crops is poor.

This soil occurs in transitional areas between the general areas of medium-textured soils of the prairies and the light-colored sandy soils. Some of the larger bodies are east of Quinlan and southeast of Greenville. The surface is flat and nearly level. Drainage is very slow and, in places, deficient. The native vegetation consisted of grass with scattered post oak and blackjack oak trees on some of the sand mounds.

This soil is less productive than the typical soil. As a rule, it is too wet during the early part of the growing season to allow rapid growth of crops. During 1933 and, according to farmers, during most years, cotton plants were affected by rust. a reddish spotting and discoloration of the foliage. About one-half of the land is in cultivation, and some areas formerly cultivated have been abandoned. Cotton occupies about two-thirds of the land in crops, corn about one-fifth, and oats, sorgo, and grain sorghums most of the rest. Cotton yields about 100 pounds of lint to the acre, corn 8 bushels, oats 15 bushels, grain sorghums 10 bushels, and sorgo forage 1 to 1½ tons. Most of this soil occurs within communities where the best farming methods are not practiced.

Crockett very fine sandy loam.—Crockett very fine sandy loam is similar to Wilson very fine sandy loam in many features, but it differs from that soil in having a browner and lighter colored surface soil and a more compact subsoil of true claypan character, conspicuously mottled with reddish brown. In contiguous areas of these soils, the change of one to the other is gradational, and areas of each soil include areas of the other. Crockett very fine sandy loam is characterized by a pale-gray layer at the base of the surface soil, by the extremely compact character of the upper subsoil layer, by the abundance of small iron concretions, and by the wavelike form of the contact between the surface soil and subsoil. The subsoil is more compact than is typical for soils of the Crockett series. The physical characteristics are less favorable for the growth of crops, and the productivity is lower than in Wilson very fine sandy loam.

The surface soil consists of grayish-brown moderately acid friable very fine sandy loam ranging from 10 to 30 inches in thickness. Extremes in thickness of this layer occur in places within a distance of 25 feet. A layer, ranging from a mere film coating the soil aggregates to a solid layer 1½ inches thick, of pale-gray very fine sandy loam is present immediately beneath the surface soil. This rests abruptly on the upper subsoil layer which is dark reddish-brown acid extremely compact clay mottled with red and dark gray. When dry, the material breaks into very hard irregular clods with dominantly vertical cleavage. The natural structure particles are coated with a thin film of dark-brown slightly vitreous material. This layer is so compact that plant roots largely follow natural crevices and water penetrates very slowly. The 5- to 7-inch upper subsoil layer grades into yellowish-brown noncalcareous very compact clay which breaks into clods larger than those in the layer above. At a depth ranging from 3 to 4 feet, this material gives way to gray and yellow streaked noncal-

careous compact very fine sandy clay, in which the gray occurs as bands along crevices and the yellow occupies the interiors of the structure fragments. At a depth of about 6 feet this material, in turn, grades into yellow or brownish-yellow noncalcareous very fine sandy clay. Small black hard shotlike concretions of iron oxide are moderately abundant in the upper subsoil layers.

In cultivated fields a hard crust forms on the surface when the material dries following a heavy rain. The immediate surface soil is brownish gray when dry, but, when moist, it is friable and works readily to an excellent seedbed. Dry clods of the surface soil material are very hard. The upper part of the subsoil is a claypan, although not an extremely dense one. Because of the unfavorable subsoil, rain water is not absorbed readily, and in dry weather crops suffer sooner than they do on soils with less impervious subsoils.

The relief is gently undulating, and the slope ranges between 1 and 4 percent. All areas have adequate drainage. This soil occurs only in a few broad uniform areas, the largest lying a few miles east of Lone Oak. Smaller areas are at the southeastern edge of Commerce, east of Quinlan, and near Weiland School southeast of Greenville. Originally the soil supported a good growth of grasses, but practically none of this remains, as most of the land has been in cultivation at some time.

About 70 percent of the total area is in cultivation. Cotton occupies about three-fourths of the cropland, corn about one-tenth, oats about one-sixth, and sorgo and grain sorghums most of the rest. The yields are about 110 pounds of lint cotton to the acre, 8 bushels of corn, 15 to 20 bushels of oats, 10 bushels of grain sorghums, and 1 to 2 tons of sorgo forage. Average acre yields of about 150 pounds of lint cotton are obtained on some of the more productive fields. Severe erosion occurs on unprotected moderately sloping areas and in fields planted to intertilled crops.

Crockett very fine sandy loam, rolling phase.—Crockett very fine sandy loam, rolling phase, is a brown sandy prairie soil that is associated with Wilson very fine sandy loam but occupies more rolling relief. The 5- to 10-inch surface soil consists of brown or grayish-brown moderately acid friable very fine sandy loam which changes, through a thin transitional layer, to the underlying subsoil material. The upper part of the subsoil is dark reddish-brown slightly acid compact clay splotched with red and some yellow and dark gray. The red splotches range from one-eighth to one-fourth inch in diameter and occur without relationship to structure. At a depth of about 20 inches, the subsoil grades into yellowish-brown compact noncalcareous clay, with dark-brown films along the vertical cracks. At a depth of about 3 feet, this material, in turn, grades into dull-yellow or brownish-yellow slightly calcareous compact sandy clay containing a few concretions of calcium carbonate and a few roundish iron pellets. The parent material, a brownish-yellow calcareous compact sandy clay, underlies this soil at a depth of about 6 feet.

The structure of this soil is similar to that of Wilson very fine sandy loam. The subsoil is compact but is not a true claypan. There is no gray layer directly beneath the surface soil. On the average, the reaction of this soil is slightly less acid than that of Wilson very fine sandy loam. Varying degrees of erosion have produced wide

variations in the soil, and in small areas erosion has removed all the surface soil. The bodies of this soil contain some slick spots similar to those in areas of Wilson very fine sandy loam.

The soil occupies slopes and knolls within smooth areas of the Wilson soils. The slope ranges from 2 to 8 percent, and drainage is excessive. All cultivated areas erode severely unless protected by close-growing crops, and many of the abandoned-field pastures have a plant cover of grasses and weeds, which is too thin to control erosion. The native vegetation was grass.

Originally, the productivity of this soil was only slightly less than that of Wilson very fine sandy loam, but now it is much less and varies according to the extent of injury by erosion which, in most places, is sufficient to make the soil unsuitable for the growing of crops. Probably the best use for such land is pasture or meadow. Nearly all the land has been cultivated at some time. Fields have been abandoned until now only about one-fifth of the total area is in cultivation, and on this productivity is low. Cotton occupies about three-fifths of the cropped acreage; oats and sorgo most of the rest. The average yields are probably about 80 pounds of lint cotton, 10 bushels of oats, and 1 ton of sorgo forage to the acre. On the least eroded fields the yields approximate those obtained on Wilson very fine sandy loam. The land is utilized largely as abandoned-field pasture which has very low carrying capacity. In a few areas, where the abandoned fields have been seeded and mowed to control weeds, good stands of desirable pasture plants have been obtained.

Crockett clay loam, eroded phase.—Crockett clay loam, eroded phase, has a 3- to 5-inch surface soil of brown friable slightly acid clay loam, which grades, through a thin transitional layer, into the upper subsoil layer of brown noncalcareous compact clay mottled with rusty red and some yellow and dark gray. This, in turn, grades into yellow or mottled yellow and gray compact noncalcareous clay at a depth of about 18 inches. Below a depth of about 3 feet is the lower subsoil layer of dull-yellow calcareous compact clay containing white concretions of calcium carbonate and streaks and spots of black or rusty-brown iron concretions.

This eroded soil has the same sloping, eroded, and variable features as has Crockett very fine sandy loam, rolling phase, from which it differs in the heavier texture of the surface soil and in the slightly darker and less red color of the surface soil and upper subsoil layer. The slope ranges from 3 to 6 percent. Areas of this soil include some slick spots, like those described under Wilson very fine sandy loam, together with many small bodies of shallow Crockett very fine sandy loam, rolling phase. In most areas much of the surface soil has been removed by erosion.

Most of this soil occurs on slopes adjacent to areas of Wilson silt loam and Wilson clay loam. Two of the largest and most typical bodies are those near Neyland and Malloy School in the east-central part of the county.

The productivity ranges from low to moderate, in proportion to the degree of erosion and the length of time the land has been in cultivation. About one-half of this land has been cropped but is now retired from cultivation. At present less than one-fourth of

the total area is cultivated. Cotton occupies about three-fifths of the cultivated land, and oats and sorgo, most of the rest. The average yields are about 70 pounds of lint cotton, 15 bushels of oats, and 1 ton of sorgo forage to the acre.

LIGHT-COLORED SANDY SOILS

The group of light-colored sandy soils comprises soils with pale-yellow or light-gray moderately acid sandy surface soils that, for the most part, are underlain by acid plastic clay subsoils. These are Kirvin fine sandy loam, Tabor fine sandy loam, Tabor loamy fine sand, Bowie loamy fine sand, and Lufkin very fine sandy loam, mound phase. The forest which originally covered this land consisted principally of rather small post and blackjack oaks, together with some hickory and very little underbrush. Much of this growth remains in uncleared areas. Leaching is more thorough and the content of available plant nutrients and organic matter is smaller in these soils than in either the heavy-textured or the medium-textured soils of the prairies.

In virgin areas a ½- to 1-inch layer of forest leaves directly overlies the mineral soil. The material in the upper 2 inches of mineral soil is stained brown or grayish brown by a slight accumulation of organic matter, and it is less acid than the rest of the surface soil. With cultivation the identity of both these layers is quickly destroyed.

The soils are too acid for the successful growth of such legumes as alfalfa and sweetclover. Although liming might prove beneficial to some legumes, it probably would not increase the yields of such crops as cotton and corn. The acidity, expressed as the pH value, of the surface soil below the thin brown surface layer ranges from 4.5 to 5.5 and is commonly about 5. The upper part of the subsoil is slightly more acid than the sandy surface soil, the acidity of the subsoil gradually decreases with depth, and the reaction becomes neutral at a depth ranging from 3 to 6 feet. None of the soil layers is calcareous. The parent materials are noncalcareous marine deposits of sands and sandy clays.

These soils and many others of similar characteristics occur extensively in the timbered country of eastern Texas. In general, their productivity is low, and only a small proportion of the land is cultivated. These soils support, as a rule, a less intensive and less prosperous agriculture than do the prairie soils. When first placed in cultivation they produce fair yields for a few years, but their productivity drops rapidly unless the plant nutrients are replenished by fertilizers or manures. They are adapted to a somewhat different type of agriculture than are the soils of the preceding two groups. They are better suited to the growing of vegetables and fruits than are those soils, and they require more careful management than do those soils, in order to produce good yields. Much of the land probably could be utilized to better advantage for pasture than for cultivated crops. The growth of pasture grasses can be increased greatly through the control of brush and weeds and by the establishment of better forage plants. Possibly due to climatic conditions, trees do not grow large on these soils in this county,

and, consequently, the soils can hardly be recommended for the production of high-grade merchantable timber.

Kirvin fine sandy loam.—Kirvin fine sandy loam is sloping post oak sandy land underlain by a red clay subsoil. The 4- to 10-inch sandy surface soil consists of pale grayish-yellow loamy fine sand or light fine sandy loam, which grades sharply into the upper subsoil layer of yellowish-red moderately plastic clay. In virgin areas the surface layer, to a depth of about 3 inches, is light-brown loamy fine sand. When dry the subsoil material breaks into flat-surfaced angular cubelike fragments about one-half inch in diameter, which are hard but can be crushed between the fingers. At a depth ranging from 18 to 20 inches, the upper subsoil layer grades into yellowish-gray slightly acid moderately compact fine sandy clay loam containing some yellowish-red splotches in the upper part. The material in the lower subsoil layer, when dry, breaks into blocks about 2 inches in diameter. At a depth of about 2½ feet, the soil is underlain by the parent material consisting of a massive bed of gray noncalcerous fine sandy loam. The surface soil and subsoil layers are acid in reaction.

This soil is variable. The most typical areas occur in the more sandy sections, in association with smoother areas of Tabor fine sandy loam. In areas adjacent to Lufkin very fine sandy loam, mound phase, and those on slopes along drainageways extending into the prairie section, the surface soil is light-gray very fine sandy loam. In such places, the solid yellowish-red upper subsoil layer is less than 6 inches thick and grades into the lower subsoil layer of gray compact noncalcareous clay. In some areas, the underlying parent material is slightly calcareous, and nowhere is the reaction more than faintly acid below a depth of 3 feet. A few small areas of Susquehanna fine sandy loam are included in mapping.

This soil occurs on slopes within the general sections of light-colored sandy soils, mainly in the southeastern part of the county. The slope ranges from 2 to 10 percent. Most of the fields are severely eroded. They require protection from erosion by vegetation or terraces. Surface drainage is excessive, and internal drainage is slow.

This soil is unsuited for general use as cropland. The natural productivity is low, and the soil is so sloping that severe erosion occurs wherever the land is unprotected or is occupied by intertilled crops. Less than one-fifth of the total area is in cultivation and, as the yields of general field crops are extremely low, probably the best use for this soil is as grazing land. The smoother areas produce fairly good yields of various orchard and truck crops, berries, and grapes. Acre yields on the small area farmed are from 60 to 90 pounds of lint cotton and 5 to 10 bushels of corn. Cotton occupies about three-fifths of the cropped acreage, and corn is the only other extensive crop. Small acreages are devoted to cowpeas, peanuts, sweetpotatoes, berries, and peaches.

The soil is responsive to good management and could be built up to a fair state of productivity by adding organic matter and fertilizers. The land can be converted into comparatively valuable grazing land by clearing the underbrush and timber, controlling the weeds by mowing, and establishing suitable pasture grasses and forage

plants. For best results, even in pastures, the soil requires amendments and protection from erosion.

Tabor fine sandy loam.—The surface soil layers of Tabor fine sandy loam have a combined thickness ranging from 12 to 24 inches. In virgin areas the surface soil includes a 3-inch surface layer of light-brown slightly acid loamy fine sand and a thick subsurface layer of pale-yellow or grayish-yellow acid loamy fine sand faintly mottled with gray in the lower part. The material is faintly cloddy, and it crusts in cultivated fields following hard rains. It grades into the upper subsoil layer, which ranges from 6 to 10 inches in thickness and consists of brownish-yellow acid plastic clay containing some red splotches. This material passes, at a depth ranging from 22 to 30 inches, into yellow plastic slightly acid clay. At a depth of about 4 feet, the lower part of the subsoil becomes more sandy and grades into the parent material of light grayish-yellow or gray noncalcareous sandy clay or fine sandy loam.

The land is smooth, and drainage is slow. The slope ranges from nearly level to about 3 percent. The smooth surface is interrupted by many low mounds of loamy fine sand. Most areas include a few small depressed areas of Lufkin very fine sandy loam. The soil occurs, for the most part, as a few broad uniform areas on stream divides. The largest are in the vicinity of Stringtown School west of Quinlan, west of Campbell, and in the extreme southwestern part of the county.

This soil is not well suited to the production of the general field crops, as its natural productivity is low and as it occurs within a timbered section where the cotton boll weevil causes severe damage. The soil is responsive to fertilization and good management, and it is suitable for the production of fruit and truck crops. The soil has favorable physical characteristics. It warms slightly late in the spring, as the lower part of the surface soil becomes saturated with water during the winter, but crops withstand dry weather fairly well. Fairly good yields of all crops are obtained on new land or on those few fields in which fertility is maintained. About 30 percent of the total area is in cultivation, and various special crops, including cowpeas, peanuts, sweetpotatoes, cucumbers, strawberries, and peaches, are comparatively important. Cotton occupies about two-fifths of the cropped acreage, corn about one-fourth, and the special crops most of the rest. Cotton yields from 75 to 100 pounds of lint to the acre, and corn, 5 to 10 bushels. About one-third of the area is abandoned-field pasture.

Tabor loamy fine sand.—Tabor loamy fine sand is similar to Tabor fine sandy loam, but it differs from that soil in that it has a somewhat darker surface soil. The surface soil includes a 10-inch surface layer of brown or light-brown mellow slightly acid loamy fine sand and a 5- to 20-inch subsurface layer of brownish-yellow mellow slightly acid loamy fine sand. At a depth ranging from 15 to 30 inches the sandy surface soil grades into the 4-inch upper subsoil layer of moderately acid friable brownish-yellow fine sandy clay loam that is strongly splotched with red. This, in turn, grades into brownish-yellow acid plastic heavy clay. At a depth of about 4 feet, the subsoil gives way to the parent material of gray noncalcareous sandy clay splotched with yellow. The surface soil is

loose in cultivated fields, and it has a gray hue when dry. The plowed layer is less dark than the material below plow depth or than the surface soil to the same depth in areas which never have been cultivated.

A few small areas of Kirvin fine sandy loam on the crests of gentle knolls are included on the soil map. The areas in the vicinity of Camp Ground School have a light-brown surface layer, about 8 inches thick, that grades into a pale-yellow subsurface layer.

The soil occurs mainly in the vicinity of Neyland. The relief is smooth, both surface and internal drainage are good, and erosion is not active in cultivated fields. Apparently the original native growth was a gradational prairie-timber growth, with some tall prairie grasses on the darkest areas and open oak forest on the areas adjacent to Tabor fine sandy loam.

This is one of the best soils in the county for the production of truck and orchard crops. It is not well suited to cotton, partly because the supply of plant nutrients is rather low and partly because it occurs near or within timbered sections, where the boll weevil is more destructive than in the prairie sections. Moisture is readily absorbed and retained. With improvement and maintenance of fertility, this soil produces from fair to good yields of the regular field crops—corn and cotton. Some of the most highly productive orchards—are on this soil. About 50 percent of the land is now in cultivation, and the greater part of the rest has been cultivated and later abandoned, owing to depletion of fertility and infestation with Bermuda grass. Cotton occupies about one-half of the cropped acreage and corn about one-fourth. Various special crops, including cowpeas, peanuts, sweetpotatoes, sorgo for sirup, cucumbers, berries, and peaches, occupy small acreages and produce well. Under prevailing practices, cotton yields from 80 to 100 pounds of lint to the acre, and corn, 8 to 10 bushels.

Bowie loamy fine sand.—The surface soil of Bowie loamy fine sand is an almost loose slightly acid loamy fine sand ranging from 24 to 36 inches in thickness. In virgin areas the 3-inch immediate surface layer is light brown and grades into pale yellow. In cultivated fields the surface soil, to a depth of about 6 inches, is brownish gray. The upper subsoil layer, which is about 12 inches thick, is yellow friable noncalcareous fine sandy clay or fine sandy clay loam, which gives way, at a depth ranging from 36 to 48 inches, to yellow friable noncalcareous fine sandy clay loam containing, in places, some gray mottlings and numerous large bright-red splotches. The red splotches occupy the centers of breakage fragments. At a depth of about 7 feet, this material grades into red noncalcareous compact fine sand, with gray streaks and tubes along crevices. Below a depth of about 10 feet, the material is yellowish-gray compact noncalcareous fine sand.

The principal areas of this soil occur in the vicinity of Campbell and near Whitehead School in the southwestern part of the county. This is a smooth soil with good surface and internal drainage. Cultivated fields are not subject to active erosion.

The physical characteristics of Bowie loamy fine sand are favorable. The soil is permeable, easily cultivated, and absorptive and retentive of large amounts of moisture. The surface soil is suf-

ficiently loose to allow some soil blowing, especially following a peanut crop. The content of avaiable plant nutrients is comparatively small. The natural productivity of this soil is low, but its response to good management is marked. The maintenance of productivity, however, is rather difficut or expensive. For these reasons, the soil is not well suited for the production of general crops, such as cotton and corn, but it is an excellent soil for various fruit and truck crops, berries, and grapes.

About two-fifths of the total area is in cultivation, and there are several abandoned farms. About two-fifths of the cultivated acreage is taken up by cotton, one-fourth by corn, and most of the rest by special crops, including cowpeas, peanuts, sweetpotatoes, sorgo for sirup, cucumbers, peaches, and berries. Yields range from less than 60 pounds of lint cotton and 8 bushels of corn an acre in old fields where fertility has not been maintained to about one-third bale of cotton and 15 bushels of corn on newly cleared land. A few farms located on this soil specialize in the production of fruit and truck crops.

Lufkin very fine sandy loam, mound phase.—Lufkin very fine sandy loam, mound phase, is an ash-gray soil which occurs on poorly drained flats, commonly known as "post oak flats," within the timbered section. The surface soil is ash-gray crusty acid very fine sandy loam, from 4 to 12 inches thick. When moist it is friable and works to a good seedbed, but when dry it is very hard and cloddy. On drying, a very hard crust forms on the surface, and this frequently prevents the emergence of newly planted crops and causes poor stands. When dry the surface appears almost white. The surface soil is rather abruptly underlain by light-gray very tough and compact acid heavy clay which, with depth, becomes slightly lighter colored and less acid. Below a depth of about 5 feet, the material is pale-gray very compact noncalcareous clay. All areas of this soil include a few sand mounds occupied by Tabor fine sandy loam or similar soils.

The largest areas of this soil occur about 6 miles northwest of Quinlan and in the vicinity of Mount Bethel School south of Greenville, and smaller areas are along the northern sides of Cow Leech and South Forks of Sabine River. The land is nearly level, and drainage, both surface and internal, is very slow. Following heavy rains, shallow pools of water stand on the surface of timbered areas for weeks at a time. Drainage improves somewhat after the land is cultivated, and, according to farmers' reports, the productivity gradually increases during the first 10 years of cultivation.

This is a soil of rather low inherent productivity. In Lufkin fine sandy loam, a closely related soil, on the Texas Agricultural Experiment Station farm at College Station, the productivity has been increased by good management to the point that the average yield of cotton is more than one-half bale to the acre. In Hunt County the acre yields are about 80 to 100 pounds of lint cotton, 8 to 10 bushels of corn, 15 bushels of oats, 10 bushels of grain sorghums, and 1 to 1½ tons of sorgo forage. About one-fourth of the land, of which cotton occupies about three-fourths, corn one-fourth, and oats, sorgo, grain sorghums, peanuts, and cowpeas the rest, is in cultivation. Very little of the cultivated land has been abandoned.

SOILS OF THE BOTTOM LANDS

This group includes the several soils of the stream flood plains—namely, Trinity clay, Kaufman clay, Catalpa clay, Kaufman clay loam, Kaufman clay loam, high-bottom phase, Kaufman fine sandy loam, Kaufman fine sandy loam, high-bottom phase, and Ochlockonee loamy fine sand. These soils consist of alluvium which represents soil materials washed from the upland. These are largely unaltered stream sediments of a character determined by the soils from which they have been washed. In the blackland prairie these soils are, for the most part, dark-colored heavy clays, but along the smaller streams that drain areas of light-colored sandy soils they are sandy and less fertile. The productivity of these soils and their utility as farm land depend largely on their drainage and the degree to which they are subject to overflow. The potential productivity of all is high. Because of their position, these soils obtain large stores of soil moisture from the overflows. They are the best soils in the county for the production of corn. Many fields are subject to continual infestation with Johnson grass, which is widely disseminated by flood waters. These soils are used largely for the production of cotton and corn where drainage conditions allow.

Trinity clay.—Trinity clay consists of a thick layer of black or very dark gray highly calcareous plastic clay which gradually becomes lighter in color with depth. The color of the soil material is only faintly less dark at a depth of 3 feet than on the surface, and the surface soil and subsoil are not distinct. At a depth of about 6 feet, the dark layer grades into gray highly calcareous plastic compact heavy clay which is extremely plastic and sticky when wet. The soil is crumbly in cultivated fields, and the plowed surface soil is a loose mass of fine hard grains. The tilth is similar to that of Houston black clay. The soil does not crust following rains, but deep cracks form during protracted dry periods.

Trinity clay is largely confined to the flood plains of small streams originating in the sections of heavy-textured prairie soils. Owing to its occurrence along the smaller streams that drain water off the land rapidly, the overflows are not very destructive. Internal drainage is slow. In some other counties this same soil occupies the broader flood plains of large streams where it is subject to more excessive overflows. The land is nearly level. The native timber growth consists mainly of bois d'arc, hackberry, and several species of oak, ash, and elm.

Wherever Trinity clay is not flooded too frequently, it is excellent land for the production of crops. Along the smaller streams and where protected from overflow by levees, the average yield of cotton is approximately one-half bale to the acre, and of corn about 35 bushels. As the soil is very fertile, all crops make a rank growth. It produces a heavy growth of cotton, and, during certain seasons, the boll weevil, cotton leafhopper, and other insects are very destructive. Cotton root rot is practically absent on this soil in this county. Alfalfa thrives in the better drained areas. The soil contains a very large amount of available plant nutrients and has the capacity for holding a large amount of soil moisture. Crops, therefore, seldom deteriorate greatly because of drought. About one-half of the total

area is in cultivation, about three-fifths of which is devoted to cotton, one-third to corn, and the rest to sorgo, grain sorghums, and alfalfa. The prevailing acre yields are about 200 pounds of lint cotton, 30 bushels of corn, from 2 to 3 tons of alfalfa, 25 bushels of grain sorghums, and 3 tons of sorgo forage.

Kaufman clay.—Kaufman clay differs from Trinity clay in that it is noncalcareous. Although free carbonate of lime is not present, the reaction is neutral, and apparently the content of lime is sufficient for good growth of all crops. From an agricultural point of view, the soil apparently is identical with Trinity clay. It consists of a thick layer of black or very dark gray noncalcareous plastic heavy clay which gradually becomes lighter colored with increase in depth. As in the Trinity soil, the color of the soil material is only faintly less dark at a depth of 3 feet than on the surface. At a depth of about 6 feet the black layer grades into gray noncalcareous plastic compact heavy clay. The material is very sticky and plastic when wet, but the surface material is crumbly when dry and has an excellent tilth similar to that of Houston black clay.

Kaufman clay occupies the flood plains of all the larger streams and those of a few small streams which originate in and drain areas of soils consisting largely of Wilson clay and Hunt clay. It is one of the most extensive soils in the county. A large proportion of the soil occurs along large streams where floods are most injurious. In this county, Kaufman clay is, as a rule, less well drained than Trinity clay. The relationship between drainage conditions in the two soils is due to differences in the general distribution of upland soils within different drainage areas. In some of the bottom lands along the larger streams, floods are so frequent and prolonged that successful production of crops is not possible. The land is nearly level, and the soil has practically no underdrainage. The native vegetation is a dense timber growth consisting mainly of elm, hackberry, ash, bois d'arc, and several species of oak, together with a few sycamore and pecan trees immediately adjacent to the stream channels.

Aside from poor drainage, the characteristics and features of this soil are very favorable for the production of crops. Wherever the land is adequately drained, acre yields of about 250 pounds of lint cotton, 35 bushels of corn, 3 tons of alfalfa, 25 to 35 bushels of grain sorghums, and 3 tons of sorgo forage are obtained. As most of the areas in cultivation are somewhat inadequately drained, however, the average yields on all cultivated areas are only about three-fifths of those on the better drained areas. About one-fourth of this land is devoted to crops. Practically none of the land in those areas that lie along Caddo Creek and South Fork Sabine River, which lie east of the Greenville-Quinlan highway, or in those along Cow Leech Fork Sabine River, south of United States Highway No. 69, between Greenville and Lone Oak, is in cultivation. Cotton occupies about three-fifths of the cultivated area, corn about one-third, and grain sorghums, sorgo, and alfalfa the rest.

Catalpa clay.—Catalpa clay is a bottom-land soil similar to Trinity clay, but it differs from that soil in that it is brown rather than black and has much better natural drainage. The Catalpa soil is brown or yellowish-brown calcareous clay which is sticky when wet

but crumbly when slightly moist or dry. This material grades, at a depth of about 6 feet, into yellow highly calcareous clay. The soil consists of largely unaltered stream sediments washed mostly from the more sloping areas of the heavy-textured prairie soils. It is developed principally along Dulaney Creek in the northwestern part of the county. Its total extent is less than 1 square mile.

Although the land is subject to overflow, the flood waters recede quickly, and drainage is adequate for the successful production of crops. About two-thirds of the total area is cultivated land, of which cotton occupies about three-fifths, corn one-third, and sorgo, alfalfa, grain sorghums, and Johnson grass meadow the rest. Cotton returns about 250 pounds of lint, corn 35 bushels, sorgo 3 tons of forage, alfalfa 3 tons, grain sorghums 25 to 35 bushels, and Johnson grass 2 to 3 tons of hay to the acre.

Kaufman clay loam.—To a depth of about 4 feet, Kaufman clay loam consists of dark-gray or dark grayish-brown noncalcareous friable clay loam or silty clay loam underlain by light-gray or light grayish-brown noncalcareous or slightly calcareous rather compact clay loam or clay. The soil is about neutral in reaction and contains sufficient lime for the growth of such legumes as alfalfa. It occurs extensively on the flood plains of streams which drain areas occupied chiefly by Wilson soils. Although the land is subject to overflow, the flood waters recede quickly, and in nearly all places drainage is adequate for the successful production of crops. The substrata below this soil are permeable, although water penetrates slowly, and the soil dries more rapidly than does Trinity clay. In cultivated fields the soil has a fine-crumb tilth.

The native timber growth consists of hackberry, elm, ash, several species of oak, and some pecan. The oaks are more numerous and the elms are fewer than on areas of Trinity clay. In addition, underbrush, especially buckbrush, is much more abundant.

This soil contains a good supply of available plant nutrients and has physical characteristics very favorable for the growth of crops. It receives and stores large amounts of water, and crops generally are not injured by droughts. This is inherently one of the best soils in the county for the production of corn, and, as most farms on this soil contain other cropland much less productive for corn, the proportion in corn is relatively high. About three-fifths of the total area is in cultivation. About one-half of the cultivated land is used for cotton, two-fifths for corn, and the rest for sorgo, Johnson grass meadow, grain sorghums, and alfalfa. The average acre yields are about 200 pounds of lint cotton, 25 bushels of corn, between 20 and 25 bushels of grain sorghums, 2 tons of Johnson grass hay, 3 tons of alfalfa, and 3 tons of sorgo forage. A few of the most thrifty and productive pecan orchards in the county are on this soil.

Kaufman clay loam, high-bottom phase.—Kaufman clay loam, high-bottom phase, consists of brown or dark grayish-brown noncalcareous friable clay loam which continues to a depth ranging from 2 to 3 feet, where it is underlain by lighter brown noncalcareous friable clay loam. The soil consists of local alluvium washed from adjacent hillsides, which are occupied mostly by Crockett soils, and deposited in the form of gently sloping alluvial fans along the margins of flood plains.

The areas of this soil lie above normal overflow but are covered occasionally by run-off waters from adjacent slopes and minor local valleys. They are subject to more or less continuous deposition of fresh material washed from the adjacent hillsides. Agriculturally the difference between this soil and typical Kaufman clay loam is the freedom from destructive floods. The slope ranges from about ½ to 3 percent. Surface drainage is free but not excessive.

As this high-bottom soil consists essentially of unaltered sediments, it is somewhat variable from place to place. The soil in a few areas, on the south side of South Sulphur River consist of brown calcareous. In places immediately adjacent to Trinity clay and Kaufman clay, the soil is underlain, at a depth ranging from 18 to 36 inches, by black clay, and it represents areas of those soils that have been covered by overwash material. The areas 2 miles east of Quinlan on the south side of Caddo Creek, and north of Campbell on the south side of South Sulphur River consist of brown calcareous clay and constitute included areas of a soil which, had the areas been large enough to show on the small-scale map, probably would be designated Houston clay, colluvial phase.

This soil occurs mostly as areas adjacent to the southern sides of the flood plains of the larger streams. The largest areas are along South Sulphur River 4 miles northeast of Celeste; along Cow Leech Fork Sabine River northwest of Greenville and west of Lone Oak; and along South Fork Sabine River east of Camp Ground School and north of Whitehead School. Most of the areas are sufficiently large for the laying out of well-shaped fields for crops.

About two-thirds of the total area of this soil is in cultivation, and none of the land has been abandoned. Cotton occupies about three-fifths of the cropped land, corn about one-third, and sorgo and grain sorghums most of the rest. The yields are about 225 pounds of lint cotton, from 25 to 30 bushels of corn, 20 to 30 bushels of grain sorghums, and 2 to 3 tons of sorgo forage to the acre.

Kaufman fine sandy loam.—Kaufman fine sandy loam consists of dark grayish-brown or grayish-brown noncalcareous friable fine sandy loam, to a depth of about 12 inches, which grades into lighter colored grayish-brown or pale-brown noncalcareous friable fine sandy loam that continues to a depth of several feet. The reaction of the soil is about neutral.

The soil has a medium-crumb tilth and is easily cultivated. It is subject to occasional overflows, but these generally do not injure crops greatly. The floodwaters recede quickly, and the soil has good internal drainage. The native timber growth consisted mostly of elm, hackberry, hickory, pecan, redbud, and several species of oak. The soil occupies the flood plains of small streams draining general areas of Wilson very fine sandy loam and Crockett very fine sandy loam, rolling phase. The texture is somewhat variable, and the areas mapped include small bodies of very fine sandy loam and loam.

Kaufman fine sandy loam is well suited to the crops commonly grown. The principal unfavorable feature in the use of this soil as farm land is its occurrence in small irregular-shaped areas. Most of it is surrounded by soils of low productivity. It is especially valued for corn, as it occurs within a general section where produc-

tive soils for corn are scarce. About one-half of the total area is in cultivation. About one-half of the cropped acreage is devoted to corn, slightly less than one-half to cotton, and most of the rest to pecan trees, sorgo for sirup, and Bermuda grass meadow. Cotton yields an average of about one-third of a bale to the acre, and corn 20 bushels.

Kaufman fine sandy loam, high-bottom phase.—Kaufman fine sandy loam, high-bottom phase, is grayish-brown or dark grayish-brown noncalcareous friable fine sandy loam to a depth of several feet. In places the color is yellowish brown. The soil occurs as alluvial fans at the bases of steep slopes. The largest area, which includes several thousand acres, is south of Quinlan on the southern side of the flood plain of South Fork Sabine River. The land lies above normal overflow, but occasionally it is covered with run-off waters from the adjacent hillsides. This soil receives frequent deposition of materials washed from the adjacent highlands. The slope ranges from ½ to 3 percent. The soil has good internal and surface drainage.

This is a productive soil well adapted to the crops of the section. About two-thirds of the total area is in cultivation, and of this cotton occupies about three-fifths and corn about one-third. The average acre yields are about one-third bale of cotton and 20 bushels of corn.

Ochlockonee loamy fine sand.—Ochlockonee loamy fine sand consists of mellow slightly acid or neutral grayish-brown loamy fine sand grading into light grayish-brown or pale-brown noncalcareous mellow loamy fine sand which, at a depth ranging from 4 to 5 feet, grades into pale grayish-yellow noncalcareous loamy fine sand. The soil is formed largely from unaltered stream sediments washed from areas of light-colored sandy soils. As the parent soils are low in fertility, this soil, which also is light and porous, is not so well supplied with plant nutrients or so productive as are the heavier textured bottom-land soils. It is, however, suited to all the common field crops of the section and is especially valued for the production of sorgo for sirup, sweetpotatoes, and many other truck crops. It occupies the narrow flood plains of small streams draining areas of light-colored sandy soils, and it occurs as narrow strips surrounded by soils of low productivity.

Two of the larger bodies are along Dry Creek in the southwestern part of the county and along Cedar Creek west of Lone Oak. A fairly large area along the southern edge of the flood plain of South Fork Sabine River is a gently sloping flat lying above overflow and constitutes an included area of a high-bottom phase. The total area of this soil is small.

About one-third of the land is in cultivation. Cotton and corn each occupy about two-fifths of the cropped land, and the rest is devoted to Bermuda grass meadow and truck crops. The average acre yield of cotton is about 150 pounds of lint, and of corn about 15 bushels.

LAND USES AND AGRICULTURAL METHODS

A very large proportion of the soils of this county, including all the smooth heavy-textured soils of the prairies, all the smooth medium-textured soils of the prairies, and the better drained soils of

the bottom lands, is naturally suited to the production of general farm crops. The principal crops grown are cotton, corn, small grains, grain sorghums, and sorgo. The soils are productive and sufficiently smooth that improved farm machinery can be used and intertilled crops can be grown extensively without serious erosion. The soils are used mainly for cotton farming, without systematic rotation of crops or the use of commercial fertilizers. On most farms, green manuring or other methods of improving the soil fertility are not practiced.

The smooth heavy-textured soils of the prairies produce high yields of the commonly grown field crops. As a rule, they do not respond, to a profitable extent, to applications of commercial fertilizers, but some farmers report that good results have been obtained from the plowing under of organic matter and manure. Although these main soils are, for the most part, so smooth that erosion has not become a very serious problem, terracing and contour tillage are beneficial, through conserving soil and soil moisture on all except the practically level areas. The areas with the more favorable moisture conditions are suitable for the production of alfalfa. Although pasture plants grow well, these soils are too valuable for cultivated crops to be allowed to remain in pasture.

The smooth medium-textured soils of the prairies likewise are naturally suited to general field crops, but they are, as a whole, less productive than the smooth heavy-textured prairie soils. Corn generally does not produce good yields, and oats and grain sorghums are somewhat better adapted to these soils than is corn. In general, applications of barnyard manure or commercial fertilizers are not made. New land is markedly more productive than are fields that have been cropped for a long time, and the few areas that have been manured produce much higher yields than do other cultivated areas. Soil-improvement practices probably would prove profitable on some of these soils. Pasture plants grow well, but these soils are too productive as farm cropland to warrant their general use as pasture.

The natural productivity of the light-colored sandy soils is rather low, but, in places where the fertility has been built up by additions of organic matter and manures, good yields of general field crops and of a large variety of special cash crops and fruit and truck crops are obtained. These soils are naturally suited to a more diversified and self-sufficing type of agriculture than are the prairie soils. Many kinds of desirable pasture plants can be grown. Trees grow naturally, but the species are so undesirable for merchantable timber and grow so slowly that the use of these soils for forestry on a commercial scale does not seem feasible.

The better drained soils of the bottom lands are highly productive for general farm crops, and they produce the best yields of corn and alfalfa grown in the county. The soils, on which overflows are so frequent as to prevent the successful production of crops, are capable of supporting a good growth of pasture plants. They are also capable of producing timber for fence posts, firewood, and rough lumber. In general, these soils, especially the heavier textured ones, are so fertile that applications of fertilizer and manure are unnecessary.

The more sloping soils of the prairies, including the areas of Houston clay, Sumter clay, Sumter clay loam, Crockett very fine sandy loam, rolling phase, Crockett clay loam, eroded phase, and Wilson clay loam, slope phase, are naturally unsuited to cropping systems including largely the growing of cotton and other intertilled crops that afford little protection from soil erosion. Houston clay and Wilson clay loam, slope phase, are suited for use as general cropland, as their productivity is high enough to warrant the expense of terracing and the use of other methods for the control of erosion, which are necessary for the successful production of crops. The productivity of most areas of the other soils is too low for their profitable use as cropland, and they are best used for pasture. All these soils are potentially good for many pasture plants, and, as they occur mostly in small areas associated with land better suited for crops, they can well be utilized for pasture land.

The best suited and most largely used soils for the growing of cotton are subject to injurious infestation of cotton root rot and insects. Cotton on the Houston and related soils is especially infested with the root rot disease which in some years lowers yields greatly and also adversely affects the quality of the cotton produced. The infestation seems to be very severe only on the heavy-textured prairie soils. According to a survey made by the senior author late in 1933, cotton on Houston black clay and Hunt clay in Hunt County had an infestation of root rot of 11.3 percent. The infestation apparently was slightly greater on the crop on Houston clay and Sumter clay than it was on the smoother heavy-textured soils of the prairies. Only about 1 percent of the cotton on Wilson clay was infested. There was little infestation on the medium-textured soils of the prairies and on the bottom-land soils, and none was observed on the light-colored sandy soils.

Soils which produce the largest amount of foliage on cotton appear to be those on which cotton is most affected by injury from insects. For this reason, cotton on the highly productive bottom-land soils sometimes is ruined by insects.

Some of the agricultural practices that offer major possibilities for the improvement of soil productivity are the eradication of Johnson grass and Bermuda grass from cultivated fields, the improvement of permanent pastures and the utilization of temporary pasture crops, the control of erosion, the introduction of a legume crop in the cropping system, the use of cover crops and green manures, the control of cotton root rot and various insects and pests, the growth of better adapted varieties of crops, and on some soils the application of commercial fertilizers. All these problems and many others are being studied by the Texas Agricultural Experiment Station and the United States Department of Agriculture. The following discussion is a very brief summary of some of the more important research work. More complete information may be obtained from the county agricultural agent and from various State and Federal bulletins.

The results obtained at the cotton-breeding station of the Department of Agriculture, located 2 miles southwest of Greenville, mainly on Hunt clay, are applicable to the heavy-textured soils of the prairies of Hunt County. Likewise, with the exception of slight

differences caused by climate, the results obtained at substation No. 5 of the Texas Agricultural Experiment Station at Temple, on Houston black clay are applicable to the same soils. The results obtained at these experiment stations are the best available for the medium-textured soils of the prairies which, judging from their soil characteristics, should respond to a greater degree to soil-improvement practices than the heavy-textured soils of the prairies. For the light-colored sandy soils the results of the experimental work of substation No. 2, near Tyler, and of the main station farm of the Texas Agricultural Experiment Station at College Station, are applicable.

In this section, with its heavy-textured easily eroded soils and its torrential washing rains, it generally is not practical to attempt to cultivate fields having a slope greater than about 8 percent. Such fields in many instances probably could be utilized better for meadow and pasture crops which have a good sod to protect the soil from washing. On land with a slope of less than 8 percent, excessive erosion in cultivated fields can be prevented by terracing with proper cropping systems. Strip farming—that is, the alternation of strips of broadcast and intertilled crops—affords effective control of erosion in areas with less than about 1-percent surface slope. Extensive and severe erosion in cultivated fields has taken place only on the Sumter and Crockett soils, Houston clay, and Wilson clay loam, slope phase. Probably the most extensive damage has been on Crockett very fine sandy loam, rolling phase.

The plowing under of cover crops and green manures constitutes, in general, the only practical method of increasing the organic matter of the soils. These practices improve the physical characteristics, increase the availability of the plant nutrients, and improve the productivity of the land. Where the crops plowed under are legumes, the practice constitutes one of the cheapest methods of supplying nitrogen. The plowing under of crops other than legumes will not increase permanently the content of organic matter in the soil, as the amount of organic matter is directly related to the nitrogen content. One of the best crops for this purpose on the heavy-textured prairie soils is sweetclover. Other legumes suitable for use as green manure are hairy vetch, cowpeas, lespedeza, and soybeans. Small grains can be used as winter cover crops. Green-manure crops should be plowed under several weeks before the main crop is planted, in order that decomposition may set in and the seedbed may settle. Alfalfa is another legume which does fairly well on the heavy-textured prairie soils, where not infested with root rot, but, in general, this is too valuable a crop for hay to warrant its use as a green-manure crop.

The results of fertilizer experiments on the blackland soils are somewhat conflicting, and no positive recommendations are made. The results of cooperative fertilizer experiments on Houston black clay and similar soils have shown that these soils respond to applications of phosphoric acid and nitrogen but not to applications of potash. In general, however, the use of fertilizers on the heavy prairie soils has not been profitable. Although the application of fertilizers, especially the 11–48–0 and 16–20–0 mixtures,[8] has pro-

[8] Percentages, respectively, of nitrogen, phosphoric acid, and potash.

duced significant increases in the yields of cotton on the blackland soils, the feasibility of using fertilizers in general farm practice in this section probably will depend largely on the price of cotton and the cost of fertilizers (*5*).[9]

Although commercial fertilizers are not recommended for highly productive soils such as Houston black clay, they may prove profitable on various other soils with good physical conditions. Fertilizer trials on the experiment stations located near Tyler and at College Station, indicate that commercial fertilizers are profitable for cotton on soils similar to the light-colored sandy soils of this county (*6*). According to the results of those experiments, the best applications suggested for cotton on Kirvin fine sandy loam and similar soils are 200 to 400 pounds to the acre of 4–6–4 or 4–8–4 fertilizers. The fertilizers indicated for the somewhat heavier Lufkin very fine sandy loam are those equivalent to 200 to 400 pounds to the acre of 0–12–4 or 4–12–4.

On nearly all of the soils of this county, the supply of moisture is more likely to be a limiting factor in productivity than is the supply of plant nutrients. Good productivity of worn-out fields cannot be restored merely by the application of commercial fertilizers. The soils require an increase in the content of organic matter, and the most practical method of obtaining this increase is the plowing under of legume crops. Nearly any green vegetation plowed under will increase the bacterial activity and the availability of the plant nutrients, but the legumes are the most beneficial green manures because of the resulting increase in the supply of nitrogen. Applications of barnyard manure will increase the content of organic matter, but the available supply of this amendment is very limited. Much more care should be taken to conserve and utilize the barnyard manure properly. It should not be allowed to lie for long periods in the barnyard, as many of the valuable constituents are leached out by rains. The manure should be spread on the land as frequently as possible and should be worked immediately into the soil in order to prevent loss of nitrogen. All crop residues should be turned under. The practice of burning such organic residues causes a distinct loss of valuable material which, when plowed under, tends to improve the productivity of the soil.

Table 5 gives the approximate evaluation of each of several important factors which indicate or influence the productivity of the soils in this county. It summarizes the capabilities of the soils to produce farm crops under normal conditions of climate and culture and should give an indication of the relative value of each soil for agricultural use.

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[9] Italic numbers in parentheses refer to Literature Cited, p. 56.

TABLE 5.—*Agricultural characteristics of the soils of Hunt County, T*

EXCELLENT LAND FOR CROPS

Soil	Drought resistance of crops	Apparent inherent fertility	Susceptibility to erosion without protection	Drainage con
Trinity clay	Excellent	Excellent	None	Fair to poor
Kaufman clay	do	do	do	Fair to very p
Catalpa clay	do	do	do	Fair
Kaufman clay loam, high-bottom phase	do	Very good	Slight	Good
Kaufman clay loam	do	Excellent	None	Fair
Houston black clay	Very good	Very good	Slight	Excellent
Hunt clay	do	do	do	do
Kaufman fine sandy loam, high-bottom phase	Excellent	do	do	do
Kaufman fine sandy loam	do	do	None	Good
Wilson clay	Good	Good	Slight	Fair to good
Austin clay	do	do	do	Excellent

GOOD LAND FOR CROPS

Soil	Drought resistance of crops	Apparent inherent fertility	Susceptibility to erosion without protection	Drainage con
Ochlockonee loamy fine sand	Very good	Fairly good	None	Good
Wilson silt loam	Fair	Good	do	Fair
Wilson clay loam	do	do	Slight	Fair to good
Houston clay	Good	Fairly good	Severe	Excessive
Wilson very fine sandy loam	Poor	Fair	Slight	Fair to good

FAIR LAND FOR CROPS

Soil	Drought resistance of crops	Apparent inherent fertility	Susceptibility to erosion without protection	Drainage con
Wilson clay loam, slope phase	Poor	Fair	Severe	Excessive
Crockett very fine sandy loam	do	do	Moderate	Good to excess
Wilson very fine sandy loam, mound phase	do	do	None	Fair to poor

POOR LAND FOR CROPS

Soil	Drought resistance of crops	Apparent inherent fertility	Susceptibility to erosion without protection	Drainage con
Lufkin very fine sandy loam, mound phase	Poor	Fair to poor	None	Poor
Tabor loamy fine sand	Very good	do	Slight	Excellent
Tabor fine sandy loam	do	Poor	do	Good
Bowie loamy fine sand	do	do	do	Excellent
Crockett clay loam, eroded phase	Poor	do	Severe	Excessive
Crockett very fine sandy loam, rolling phase	do	do	Very severe	do
Sumter clay	Fair	do	do	do
Sumter clay loam	do	do	do	do
Kirvin fine sandy loam	Good	do	Severe	Good to excess

PRODUCTIVITY RATINGS

The soils of Hunt County are rated in table 6 according to their productivity for the more important crops. The soil types and phases are listed in the order of their general productivity under the prevailing farming practices, the most productive soils being at the head of the table.

TABLE 6.—*Productivity ratings of soils in Hunt County, Tex.*

Soil [1]	Crop-productivity index [2] for—						
	Cotton	Corn	Oats	Sorgo	Grain sorghums	Permanent pasture	Timber [4]
Trinity clay (areas least subject to overflow)	60	60	------	90	75	A	A
Kaufman clay (areas least subject to overflow)	60	60	------	90	75	A	A
Catalpa clay	60	60	------	90	75	A	A
Kaufman clay loam (areas least subject to overflow)	60	60	------	75	75	A	A
Kaufman clay loam, high-bottom phase	60	50	------	75	60	A	A
Houston black clay	50	40	60	60	50	A	C
Hunt clay	50	40	60	60	50	A	C
Kaufman fine sandy loam, high-bottom phase	45	40	------	60	50	A	A
Austin clay	45	30	60	50	40	A	B
Wilson clay	45	30	50	50	40	A	C
Kaufman fine sandy loam	40	40	------	60	50	A	A
Kaufman clay loam (areas most subject to overflow)	40	30	------	50	50	A	A
Ochlockonee loamy fine sand	40	40	------	------	------	A	A
Wilson silt loam	40	30	50	50	40	B	C
Wilson clay loam	40	30	50	50	40	B	C
Houston clay	35	30	50	50	40	A	C
Wilson very fine sandy loam	30	20	40	40	30	B	C
Wilson clay loam, slope phase	30	20	40	40	30	B	C
Crockett very fine sandy loam	30	20	40	25	25	B	C
Wilson very fine sandy loam, mound phase	25	20	30	25	25	B	C
Lufkin very fine sandy loam, mound phase	20	20	30	25	25	B	B
Crockett very fine sandy loam, rolling phase	20	20	30	25	25	B	C
Crockett clay loam, eroded phase	20	20	30	25	25	B	C
Sumter clay	20	20	30	25	25	B	C
Tabor fine sandy loam	20	20	------	25	20	C	B
Tabor loamy fine sand	20	20	------	------	------	C	B
Bowie loamy fine sand	20	20	------	------	------	C	B
Sumter clay loam	10	10	20	25	20	B	C
Kirvin fine sandy loam	10	10	10	25	------	C	B
Trinity clay (areas most subject to overflow)	------	------	------	------	------	B	A
Kaufman clay (areas most subject to overflow)	------	------	------	------	------	B	A

[1] Soils are listed in the approximate order of their general productivity, the most productive first.

[2] The productivity of each of the various soil types for each specific crop is compared to a standard—100—which stands for the inherent productivity of the most productive soil (or soils) of significant acreage in the United States for that crop. This productivity rating of the soils of Hunt County is based on their productivity under the prevailing farming practices.

[3] Order of preference: A, B, and C. From 3 to 7 acres of permanent pasture are required to carry 1 cow throughout the year on soils of A rating, 7 to 15 acres on soils of B rating, and more than 15 acres on soils of C rating.

[4] Order of preference: A, B, and C. Lowland hardwoods grow moderately rapidly on soils of A rating; post oak and blackjack oak grow very slowly on soils of B rating; and few trees will survive on soils of C rating.

NOTE.—Leaders indicate that the crop is not commonly grown on the particular soil type.

The rating compares the productivity of each of the soils for each crop to a standard—100. This standard index represents the inherent productivity of the most productive soil or soils of sig-

nificant extent in the United States for that crop. An index of 50 indicates that the soil is about one-half as productive for the specified crop as is the soil with the standard index. Soils given amendments, such as lime, commercial fertilizers, and irrigation, or unusually productive soils of small extent, have productivity indexes of more than 100 for some crops. The following tabulation sets forth some of the acre yields that have been set up as standards of 100. They represent long-time average yields of crops of satisfactory quality on the better soils without the use of amendments.

Crop:		
Cotton	pounds	400
Corn	bushels	50
Oats	do	50
Grain sorghum	do	40
Sorgo (forage)	tons	4

The crop indexes in table 6 refer to the productivity of the soil types under the prevailing farming practices in this county. These indexes may differ from county to county, inasmuch as practices of management and certain characteristics of soil types may vary from county to county. In Hunt County little commercial fertilizer is used. Productivity under current practices generally differs from inherent productivity, and it may or may not coincide with productivity without the use of amendments.

The estimates of average yields of different crops, especially of crops other than cotton and corn, may be considerably in error. They were made by interpretation of census data, farmers' reports, general observations, and soil characteristics. Probably few of them are within 10 percent of the true value, but they constitute the most nearly accurate information available. The estimates of yields of cotton and corn were adjusted so that the weighted average of the yields on different soils, weighted according to the estimated area of each soil devoted to cotton or corn, correspond with average yields for the county, which are fairly accurately known from census and Agricultural Adjustment Administration data. The average yields refer to those obtained under prevailing farm practices over a period of years. In using them the reader should realize that they are only approximate and that yields vary widely from year to year and according to soil management.

The natural factors influencing the productivity of land are mainly climate and soil, including relief, or lay of the land. Management and the use of amendments are additional factors. Crop yields over a long period of years furnish the best available summation of those factors contributing to productivity, and they have been used largely as the basis for the determination of the productivity indexes in the table. A low index for a particular crop may be due to some local condition of unfavorable relief, drainage, or climate rather than to lack of fertility in the soil. It will be seen from the note at the end of the table that no rating is given if the crop is not commonly grown on the particular soil type. It should be understood that the productivity ratings are not to be interpreted directly into specific land values. They are based on the essentially permanent factors of productivity of the soils and their responsiveness to management, and little attention is given to the more transitory economic conditions of land values.

MORPHOLOGY AND GENESIS OF SOILS

Hunt County lies within the eastern part of the blackland prairie, which is a southerly segment of the great north-south belt of prairie land that crosses the central part of the United States. The blackland prairie is occupied largely by dark-colored comparatively unleached soils having characteristics that primarily are an expression of the kind of materials from which they have developed rather than of the climatic environment. In general the formations giving rise to the parent materials from which these dark-colored soils have developed are unconsolidated materials consisting of clays, shaly clays, and chalk containing from small to large quantities of calcium carbonate. The soils have developed under a dense cover of tall and some small prairie grasses.

Associated smaller areas of soils developed under a growth of trees are similar to the soils of the timbered sandy-soil belt of the east-Texas timber country, which lies a few miles east of Hunt County, where the soils have developed from unconsolidated beds of sands and clays, that are not calcareous or are but slightly calcareous. The contact of the blackland prairie and the east-Texas timber country, about 30 miles east of Greenville, is approximately coincident with the contact between the Midway and Wilcox formations (*9*).

The general relationship between the geological beds exposed in this county and the soils developed on them is shown in table 7. The geological nomenclature is that of the authority quoted. The dip of the formations is given as approximately south 60° E. and averages about 75 feet to the mile. The normal succession of younger outcrop belts to the southeast is slightly disturbed by several small faults.

The soils of this county have developed under a warm humid climatic influence. The leaching process in soil development commonly is so dominant in such a climate that normally soils have developed that are free of calcium carbonate or other salts and are more or less acid. This is well evidenced in the soils developed from sandy parent materials, but some calcium carbonate is retained in all soil layers of the heavy-textured soils of the prairies, especially those developed from highly calcareous materials.

The northwestern one-third of the county (approximately) is occupied largely by the heavy-textured soils of the prairies, mostly those with smooth relief and clay texture. These soils generally are productive. They have developed chiefly from highly calcareous parent materials, and most of them are high in calcium carbonate and are of granular or crumbly structure in the surface horizons. These soils may be considered as constituting a Houston soils division.

In the southeastern two-thirds the soils are, for the most part, lighter colored prairie soils, largely medium textured. They are not so friable as are the soils of the Houston division, as they crust tightly on drying, and, as a rule, are thinner and less productive than those soils. They may be considered as soils of the Wilson division. They have developed from unconsolidated parent materials that are less calcareous than those beneath the soils of the Houston division, and which also generally contain more sand and silt.

TABLE 7.—*Geological beds exposed in Hunt County, Tex., and dominant soils developed on them*

System	Group	Formation	Description	Dominant soils
Eocene	Midway	Wills Point	Dark-gray slightly calcareous silty clays and sandy clays.	Wilson very fine sandy loam and Crockett very fine sandy loam, with some light-colored timbered soils along drainageways.
		Kincaid	60 to 80 feet of gray calcareous clays and silty clays including less amounts of glauconitic sands and lentils of limestone.	Wilson soils and Sumter clay loam, with light-colored sandy soils on the sandier beds.
Cretaceous (Upper Cretaceous or Gulf series).	Navarro	Kemp clay	Approximately 500 feet of dark bluish-gray highly calcareous clays and sandy clays, which are locally glauconitic or highly gypsiferous.	Wilson clay loam and Wilson very fine sandy loam, with a few strips of heavy-textured prairie soils on the outcrop of local marly beds.
		Nacatoch sands	100 to 150 feet of slightly calcareous gray sands and sandy clays.	Tabor fine sandy loam, Kirvin fine sandy loam, Tabor loamy fine sand, Lufkin very fine sandy loam, mound phase, and some Wilson soils.
		Neylandville clay	Approximately 300 feet of dark-gray highly calcareous shaly clays and silty clays, which locally are gypsiferous.	Wilson very fine sandy loam and Wilson clay loam, with some Houston clay on slopes.
	Taylor	Unnamed marl	Approximately 300 feet of very highly calcareous clay or marl.	Hunt clay and Houston black clay.
		Pecan Gap chalk	30 to 50 feet of bluish-gray sandy or argillaceous chalk.	Austin clay, Houston black clay, and some Wilson soils on smooth areas.
		Wolfe City sand	75 to 100 feet of gray calcareous sands and sandy clays.	Wilson very fine sandy loam, Crockett very fine sandy loam, rolling phase, Wilson clay loam, and Sumter clay loam.
		Unnamed marl	Approximately 300 feet of dark bluish-gray very highly calcareous clay or marl.	Houston black clay, Houston clay, and Sumter clay.
		A tongue of Austin chalk.	Gray chalky limestone and chalky marl.	Houston black clay, with very limited areas of Austin clay.

The light-colored sandy soils, which have been developed on the isolated areas of timberland in sections of the eastern part of the county, may be considered members of the Tabor division. These are largely sandy, with clay subsoils, or at least with subsoils that are, as a rule, heavier than the surface horizons. These soils are of low or only moderate productivity. They have developed under a timber growth, largely oak, from unconsolidated sandy clays which contain very little calcium carbonate.

The soils of the stream-bottom lands consist of deep deposits of soil materials washed from upland soils of the section, mostly from the surface soils of the three preceding groups. They are subject to added increments of soil materials during periodic overflows and have no characteristics developed in place. A heavy growth of timber covers these soils.

The smooth deep heavy-textured soils of the prairies, that is, those of the Houston division, are highly calcareous, are representative of large areas of soils of the blackland prairie, and are immature in development. The calcium carbonate of the parent material has not

been entirely leached from the soil horizons. These are known as Rendzina soils. Because of the influence of parent material on soil development the characteristics due to climatic influence have not become well established, and these soils therefore are intrazonal. Houston black clay and Hunt clay are the dominant Rendzina types in the county.

Following is a description of a typical profile of Houston black clay as it occurs in a virgin area covered with tall prairie grasses 3 miles southwest of Floyd where the smooth well-drained surface has a slope of about 1 percent:

1. 0 to 18 inches, black calcareous coarse granular clay which, when very dry, breaks into very hard roundish aggregates, from one-eighth to one-half inch in diameter, loosely held together by plant roots. In cultivated fields, clods, on drying, crumble naturally to a loose mass of angular grains one-eighth to one-sixteenth inch in diameter. Below plow depth, the material, when moist, breaks into hard clods with bumpy surfaces. The material is extremely plastic when wet but crumbly when dry. The fine aggregates are very hard.
2. 18 to 36 inches, very dark gray calcareous clay which breaks into large irregular extremely hard clods.
3. 36 to 60 inches, dark-gray extremely hard cloddy clay containing a few concretions of calcium carbonate.
4. 60 to 120 inches, gray cloddy calcareous clay with a yellowish tinge. It contains calcium carbonate concretions and spots of dark-colored surface soil material that has fallen down cracks.
5. 120 to 144 inches +, slightly altered parent material—a grayish-white very highly calcareous clay or marl.

The granular character of the surface soil is not well expressed, apparently owing to the extremely heavy texture of this soil. Its breakage in cultivated fields, whereby clods crumble to grains on drying, is a more distinguishing feature than is the structure of the soil in the virgin condition. This same type of breakage in cultivated fields is exhibited by Sumter clay, where eroded, which contains practically no organic matter, and it apparently is an expression of the extremely high content of colloids and of the large content of lime. The change from each layer to the next is gradational. The color of the subsoil, below a depth of about 5 feet, in some places is gray, as in the profile described above, and in others it is olive yellow grading to bluish gray. In the profile described the parent material is derived from a geological formation known as Taylor marl.

Houston black clay occupies a very large proportion of the smooth blackland prairie, including both the rounded divides and the gentle slopes to drainageways. It represents an early stage of development, although apparently development is as full as is normal within the section of the outcrop of very highly calcareous clays. Judging from the morphology as observed in the field, soil development has consisted principally of leaching part of the lime out of the surface layers and the accumulation of organic matter to a great depth. Little or no shifting of the other soil constituents is apparent. A few dark-brown films, which appear to be iron compounds, occur along cleavage planes in the deep substrata, and they may represent iron carried down from the surface soil. No incipient eluviated horizon is present in the surfaced soil, and no gray leached films surround the structure particles.

The immaturity of soil development of Houston black clay is due to the character of the parent rock which contains so much calcium carbonate and is so resistant to leaching that all soil layers remain calcareous. Further reasons for the immaturity of soil development lie in the character of the vegetation, which is grass, and in the comparatively small amount of water penetrating the soil. In a narrow belt extending from Whiterock to Middle Sulphur School in the north-central part of the county, the water table lies within reach of tree roots. Here the soils on the smooth areas have developed beyond the Houston black clay stage into Hunt and Wilson soils which contain less calcium carbonate. Water does not permeate the Houston black clay material readily. When dry, however, this soil absorbs moisture readily and becomes wet as far down as the underlying marl, but the moisture reaches the lower layers chiefly through the wide cracks caused by contraction and does not pass through the soil. Furthermore, some of the surface soil continually is washing into the deep cracks and bringing about a slow natural mixture of the soil materials to a considerable depth. Presumably this is one of the major causes of the extreme thickness of the dark-colored horizons. The presence of moderately abundant concertions of calcium carbonate in the deeper soil layers, which are not to be found in the unaltered parent rock, suggests that this soil may have a zone of carbonate concentration. There is no considerable movement of moisture down through the substrata, as is evidenced by the general absence of a ground water table.

Mechanical and complete chemical analyses of the various horizons and of the colloids separated from the various horizons of a profile of Houston black clay from Bell County, Tex., are reported by Middleton, Slater, and Byers (*4*). This profile has a more sloping surface than is typical for the soil in Hunt County and it contains a much higher content of calcium carbonate than is representative of the type. Eight other analyses of this soil reported in literature (*1*, *2*, *3*, *7*, *8*) show an average content of 7 percent of calcium carbonate in the surface soil, the content ranging from 1.5 to 15.9 percent. Except for the excessive content of calcium carbonate, which is indicative of somewhat less advanced soil development, the analyses of the soil in Bell County give good indications of the type of soil development of Houston black clay.

Some of the more important physical and chemical features of the horizons of Houston black clay are shown in table 8.

The free carbonates have been leached from the surface layers of Hunt clay; but the reaction of the surface soil is still neutral or only very faintly acid, and eluviation has not occurred. Within those parts of the county where this soil is dominant, it occupies the same range of topographic positions as does Houston black clay. Where areas of the two soils adjoin, Hunt clay occupies the smoother land and Houston black clay the more sloping land. It is apparent that, for the most part, areas of Hunt clay are coextensive with areas in which the underlying soil-forming parent material contains slightly less lime than does the parent material beneath Houston black clay.

The Wilson soils are more completely developed than are Houston black clay and Hunt clay. Although the Wilson soils, as developed in the southern part of the blackland prairie of Texas, have only

faintly acid or neutral surface soils, in Hunt County and vicinity they have moderately to strongly acid surface soils. The bases have been leached from the surface horizons, and typically the pH value of the 12-inch surface layer ranges between 5 and 5.5. Leaching of the free carbonates has taken place in Wilson clay to a depth of 3 feet and in Wilson very fine sandy loam to a depth of about 6 feet. Accordingly, eluviation and a marked translocation of the more finely divided materials out of the surface horizons into the subsoils have occurred. Even Wilson clay has a thin film of silty eluviated material at the immediate surface. The structure of the eluviated horizons is slightly granular, friable, and cloddy. When dry the material breaks out as only moderately hard irregular clods, from 2 to 3 inches in diameter, which have the characteristic bumpy or nodular surfaces associated with faint granulation. All structure particles are surrounded by faint films of pale-gray leached material, the gray films being more pronounced in the lower parts of the eluviated horizons. The surface soil passes, through a thin gradational layer, into the subsoil. There is no gray layer at the base of the surface soil, and the subsoil, although compact, is not a definite claypan. The cultivated surface soil of the more sandy soils is much lighter gray than the virgin soil. The characteristic differences in structure and tilth between the Wilson and the Hunt and Houston soils are more pronounced in cultivated fields than in virgin areas.

TABLE 8.—*Certain chemical and physical features of the horizons of Houston black clay*

Location of sample	Depth	SiO_2/R_2O_3		Fe_2O_3/Al_2O_3		$CaCO_3$[1]	Colloid	Organic matter[2]
		Whole soil	Extracted colloid	Whole soil	Extracted colloid			
	Inches	*Mols*	*Mols*	*Mols*	*Mols*	*Percent*	*Percent*	*Percent*
Bell County, Tex.[3]	0–3	4.99	3.26	0.256	0.200	57.1	[4] 44.9	2.94
	14–20	4.40	3.24	.261	.209	58.7	[4] 46.6	1.88
	24–36	4.35	3.25	.280	.207	66.3	[4] 44.1	1.10
	36–50	3.65	3.25	.364	.215	77.0	[4] 36.2	.51
Dallas County, Tex.[5]	0–12	6.34	3.56	.228	.220	11.6	[6] 55.6	

[1] CO_2 from carbonates × factor 2.274.
[2] CO_2 × factor of 0.471.
[3] Taken or calculated from analyses reported by Middleton, Slater, and Byers (4).
[4] Determined by mechanical analyses; particles smaller than 0.002 mm.
[5] Taken or calculated from analyses reported by Robinson and Holmes (7).
[6] Determined by water absorption.

Some areas of Wilson soils, such as those occupying the extensive flat on the southwestern edge of Fairlie, evidently are developed from extremely old stream-terrace deposits. In such areas the substrata appear to be less highly calcareous and contain numerous soft rusty-black concretions, about one-half inch in diameter, which appear to be largely iron compounds. Where the Wilson soils are developed from marine deposits, such iron concentrations are not abundant in the deep substrata. All the clay horizons of the Wilson soils show faint-yellow or somewhat red splotches of iron and contain a very few black hard shotlike concretions.

Mechanical analyses of samples of Wilson silt loam and Crockett very fine sandy loam, rolling phase, are given in table 9.

TABLE 9.—*Mechanical analyses of samples of two soils in Hunt County, Tex.*

Soil type and sample No.	Depth	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
Wilson silt loam:	*Inches*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*	*Percent*
449171	0–16	0.1	0.3	0.6	2.5	12.8	60.9	22.9
449172	16–32	.1	.3	.4	1.7	9.2	44.8	43.5
449173	32–60	.1	.3	.4	1.4	7.1	48.8	42.0
449174	60–72+	.7	.9	.7	2.1	9.9	46.8	39.0
Crockett very fine sandy loam, rolling phase:								
449111	0–8	.0	.1	.1	.7	58.3	27.5	13.4
449112	8–20	.1	.1	.1	.7	37.9	25.5	35.7
449113	20–36	.0	.0	.1	.4	37.9	21.3	40.3
449114	36–72+	.0	.1	.1	.4	44.0	25.9	29.5

In a representative virgin area, 5 miles north of Commerce, in a smooth well-drained position with a surface gradient of about 1 percent and under a dense cover of native tall grasses, the profile of Wilson clay loam is as follows:

1. 0 to 8 inches, dark-gray slightly acid clay loam. The 1-inch surface layer is gray massive clay loam. The material below breaks under pressure into moderately hard irregular clods with slightly nodular surfaces.
2. 8 to 12 inches, dark-gray slightly acid somewhat crumbly clay, with a structure similar to that in the overlying material. Faint-gray films coat the natural structure surfaces.
3. 12 to 32 inches, dark-gray extremely compact noncalcareous heavy clay which breaks under pressure into large very hard irregular clods.
4. 32 to 60 inches, light-gray extremely compact noncalcareous clay, with a few scattered spots of yellowish gray.
5. 60 to 72 inches +, yellowish-gray slightly calcareous very compact clay containing bands of limonite yellow, concretions of calcium carbonate, and soft rusty-black concretions of iron oxide.

The separation of districts of Houston black clay and associated soils from areas of the Wilson and associated soils is explained by differences in the parent rocks. In Hunt County, the general boundary between these two soil districts follows the strike of the geological beds and occurs approximately at the contact between the Taylor and the Navarro groups. The Navarro marls typically contain considerably less lime and more sand and silty material than do the Taylor marls. The general topography and physiography of the two soil districts are similar; but in their detailed occurrence a definite topographical relationship exists. In places where Houston black clay and the Wilson soils adjoin, the more sloping areas are occupied by Houston black clay and the smoother areas by the Wilson soils. A further characteristic of the relationship in occurrence consists of tongues of Wilson soils which extend along drainageways up into the general areas of heavier textured blackland soils. This is best shown along the several forks of Caddo Creek in the west-central part of the county. In such places the areas of Wilson soils are gently sloping as are the adjacent blackland soils. Such areas, in part, may represent terrace material, but in other localities it is very clear that the tongues of Wilson soils have been developed from the same beds as those beneath the adjacent calcareous soils.

The climate of Hunt County is much the same as that in the Red and Yellow soils region of southeastern United States. In this region, the leaching process is rapid in soil parent materials that allow free penetration of water, and this is evidenced in the development of light-colored acid sandy soils with well-defined textural profile development and eluviated surface horizons underlain by yellow, red, or mottled illuviated acid subsoils. Soils of such advanced maturity are limited to the group of light-colored sandy soils, represented by soils of the Tabor division. These soils have developed from sand or sandy clay beds low in calcium carbonate, beneath a cover of oak trees.

Following is a description of the profile of Tabor fine sandy loam in a virgin area in the extreme southwestern part of the county, one-half mile south of Whitehead School, on a smooth well-drained flat with a slope of less than 2 percent, a vegetation of post and blackjack oak and very little underbrush, and a ground water table more than 20 feet below the surface. A layer of forest litter ½ to 1 inch thick covers the soil. This consists of dry partly decayed and broken oak leaves and twigs abruptly overlying the mineral soil, with no suggestion of a humous layer. The pH value is 6.58.

0 to 2 inches, brown faintly acid faintly cloddy or loose loamy fine sand. The material consists essentially of quartz grains stained brown by thin films of organic matter. Worm casts in clusters are abundant. The pH value is 6.11.

2 to 16 inches, gray faintly cloddy acid loamy fine sand. When moist the material has a distinct yellow tint. The pH value at a depth of 9 inches is 5.64. At the base of this horizon is a transitional zone, 2 inches thick, consisting of dull-yellow much more acid sandy clay loam containing infiltrations of sand down the crevices.

16 to 22 inches, dull-yellow plastic acid clay mottled with yellowish red. When dry the material breaks into irregular angular fragments, about one-half inch in diameter, which are covered with faint-gray or bluish-gray films. The red mottlings occur as somewhat red specks irregularly distributed within the structure fragments. Root channels are surrounded by gray or paler yellow tubes. The pH value at a depth of 17 inches is 4.84.

22 to 42 inches, brownish-yellow plastic acid clay which breaks out as larger irregular fragments with dull-gray films along the crevices. The acidity decreases with depth, and the pH value 36 inches below the surface is 5.64.

42 to 60 inches +, yellowish-gray sandy clay containing a very few small lumps of calcium carbonate. There are bands and large spots of limonite yellow. The material in this horizon, which is the largely unaltered parent material, is much more sandy than the material of the two horizons immediately overlying. The main mass is not calcareous, and, at a depth of 54 inches, it has a pH value of 6.36.

The profile described above is that which has developed on smooth rather slowly drained surfaces from moderately sandy materials. Although development of the soil is well advanced, it is not extreme as is indicated by the reaction of the surface soil. The bases have been leached thoroughly from the topmost 3 feet of soil, but the plants obtain bases from the substrata in sufficient quantities that the fall of plant residues maintains the topmost surface layer in a nearly neutral condition. The yellow, rather than somewhat red, coloration of the subsoil possibly is due to slightly deficient aeration and drainage. The subsoil is slowly penetrable by moisture, and following extended rainy seasons the lower part of the sandy surface soil remains saturated for long periods.

In places where the soil has developed from sandy parent materials under forest vegetation, on more sloping surfaces than those occupied by the Tabor soils, the color of the upper subsoil layer is solid red or yellowish red, and all soil layers are thinner. This produces Kirvin fine sandy loam which is a normal soil but somewhat too sloping for complete development. The occurrence of small areas of this soil on gentle slopes along drainageways extending into the prairie section indicates that, in places, it has developed from the same parent materials as have the Wilson soils and represents a more advanced stage of soil development than that attained by the Wilson soils, as a result of the more rapid weathering characteristic of forest vegetation. Outstanding examples of this are the two isolated areas 2 miles southeast of Kingston and 3 miles south of Wolfe City. In these two areas invasion by timber was apparently due largely to the occurrence of a shallow water table.

The Lufkin soils have developed from heavy clays, under poor drainage and a forest vegetation. In some places Lufkin very fine sandy loam, mound phase, has developed from parent material similar to that underlying adjacent areas of Wilson very fine sandy loam which developed under prairie vegetation. Examination of the substrata underlying the Lufkin soil down to a depth of 8 feet indicates that it is less calcareous than materials at similar depth under the Wilson soils.

SUMMARY

Hunt County, which occupies an area of 893 square miles in the northeastern part of Texas, lies within the eastern part of the blackland prairie of Texas, a subdivision of the Gulf Coastal Plain. The county is a smoothly undulating plain lying from 450 to 700 feet above sea level. The original vegetation consisted largely of tall prairie grasses in the treeless sections and small oak trees in the forested sections of the upland. The climate is warm and humid. The mean annual precipitation is about 37 inches, and the mean annual temperature is about 65° F.

The agriculture is dominated by the production of cotton because of the favorable climate, the abundance of well-suited soils, and economic conditions. In 1934, 54 percent of the land was in cultivation, and cotton occupied 49 percent of the cultivated acreage. The only other crops occupying large proportions of the cultivated land are corn and oats. The average acre yield of cotton is about 150 pounds of lint; of corn, 18 bushels; and of oats, 25 bushels. Most of the land not in cultivation is utilized as pasture. To a small extent, livestock, livestock products, fruit, and truck crops are produced for sale.

The county is dominantly an area of smooth dark-colored moderately to highly productive medium-textured to very heavy textured soils developed under prairie vegetation. It lies wholly within the blackland prairie but includes a much larger proportion of Wilson and Crockett soils than is characteristic of that general soil area and, in addition, embraces isolated areas of light-colored leached sandy originally timbered soils similar to those in the main body of the sandy timbered part of the Gulf Coastal Plain. About one-third of the county, the northwestern part, is a general area of Houston

black clay and Hunt clay—smooth highly productive black crumbly heavy clay soils underlain by highly calcareous nearly impervious marine clays. These soils are well suited to and almost entirely used for general field crops. Small areas of more sloping, shallower, less dark, less productive heavy clay soils are associated with these soils, and a larger proportion of them is devoted to pasture.

The rest of the county is a general area of Wilson soils and Crockett soils. The Wilson soils are smooth, dark gray, and moderately acid, and moderately productive. They have dark-gray sandy loam or clay surface soils and very compact noncalcareous dark-gray heavy clay subsoils. The Crockett soils are more sloping and more brown than the Wilson soils. Both are used for cotton farming. This general area of Wilson and Crockett soils is interrupted by a few isolated bodies of light-colored leached sandy originally timbered soils of low inherent productivity. These are chiefly of the Kirvin, Tabor, and Lufkin series. The stream flood plains are occupied largely by Trinity clay and Kaufman clay, which are very productive where adequately drained.

At least two-thirds of the county is occupied by soils suitable for utilization as general cropland and less than one-tenth by soils unsuitable for cropland. Nearly all of the suitable land is in cultivation. The only large bodies of potentially productive land not cropped are parts of the flood plains which require artificial drainage for the successful production of crops.

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This soil survey is a contribution from

BUREAU OF CHEMISTRY AND SOILS

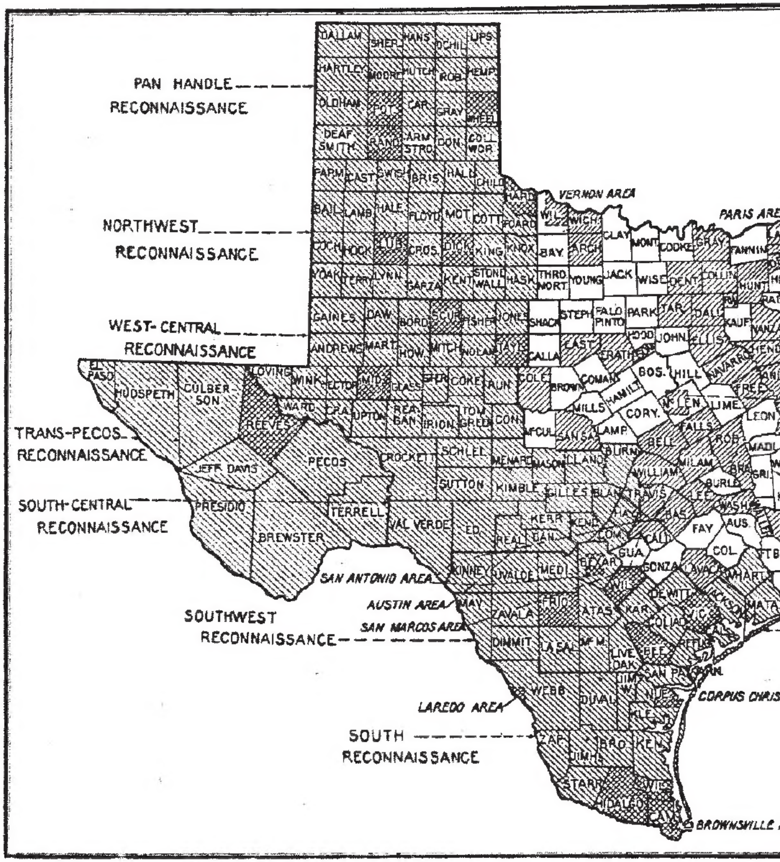
HENRY G. KNIGHT, *Chief*
W. W. SKINNER, *Assistant Chief*
F. L. TEUTON, *Chief, Information Division*

SOIL SURVEY DIVISION

CHARLES E. KELLOGG, *Chief*
W. T. CARTER, *Inspector, District 4*
J. W. MCKERICHER, *in Charge Map Drafting*

TEXAS AGRICULTURAL EXPERIMENT STATION

A. B. CONNER, *Director*



Areas surveyed in Texas shown by shading. Detailed surveys shown by northea
reconnaissance surveys shown by northwest-southeast hatching; cross ha
surveyed in both ways.

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HENRY G. KNIGHT, CHIEF
SOIL SURVEY DIVISION, CHARLES E. KELLOGG, CHIEF

SOIL MAP

HUNT COUNTY

TEXAS

TEXAS AGRICULTURAL EXPERIMENT STATION
A. B. CONNER, DIRECTOR

William T. Carter, Inspector, District 4.
Soils surveyed by E. H. Templin, in charge, and
R. M. Marshall, Texas Agricultural Experiment Station.

Scale 1 inch - 1 mile

1 ½ 0 1 2 3 4 Miles

Field Operations
Bureau of Chemistry and Soils
1934